Summer 2008

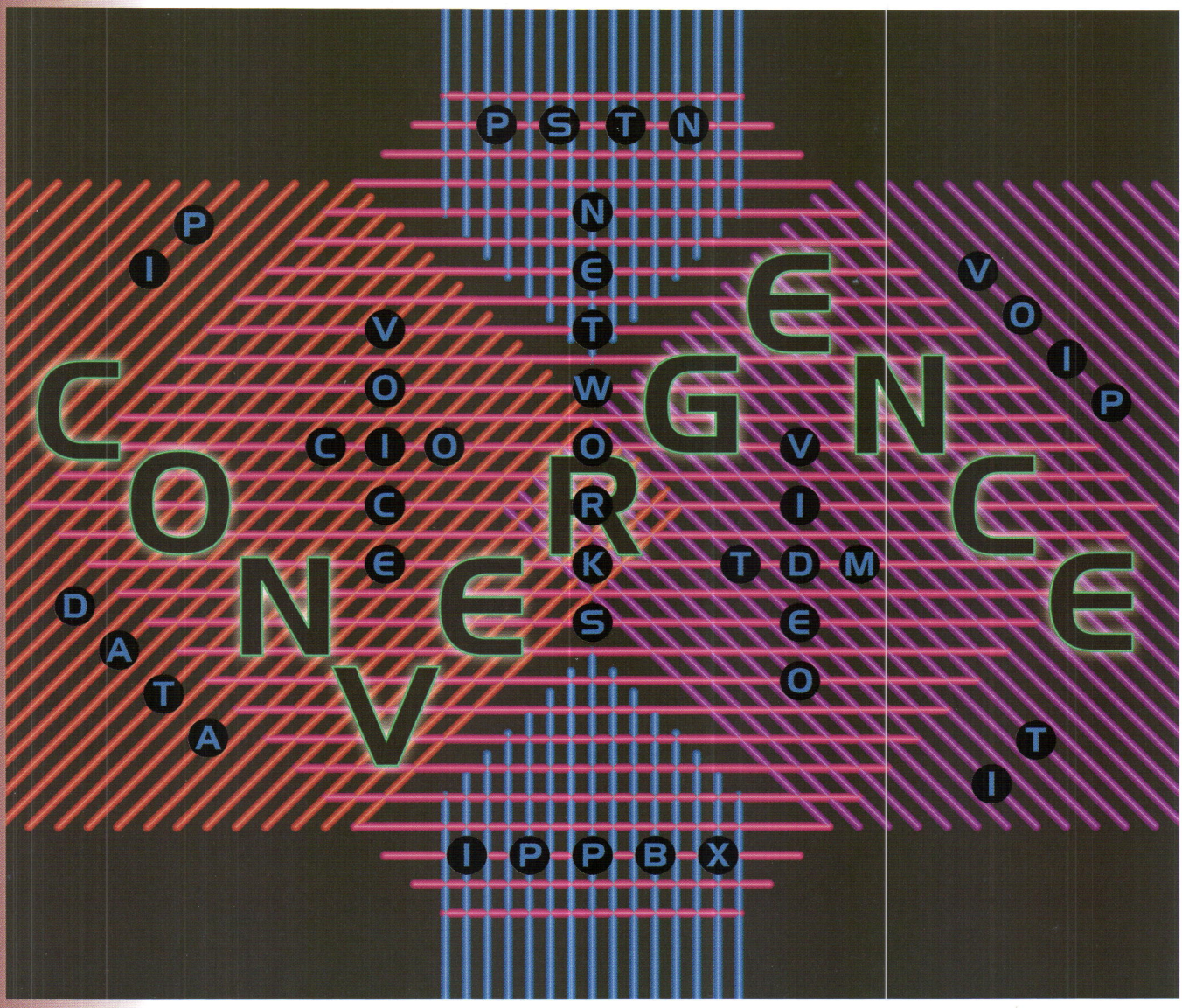
ACUTA Journal of Telecommunications in Higher Education

Summer, 2008
Vol.12, No.2

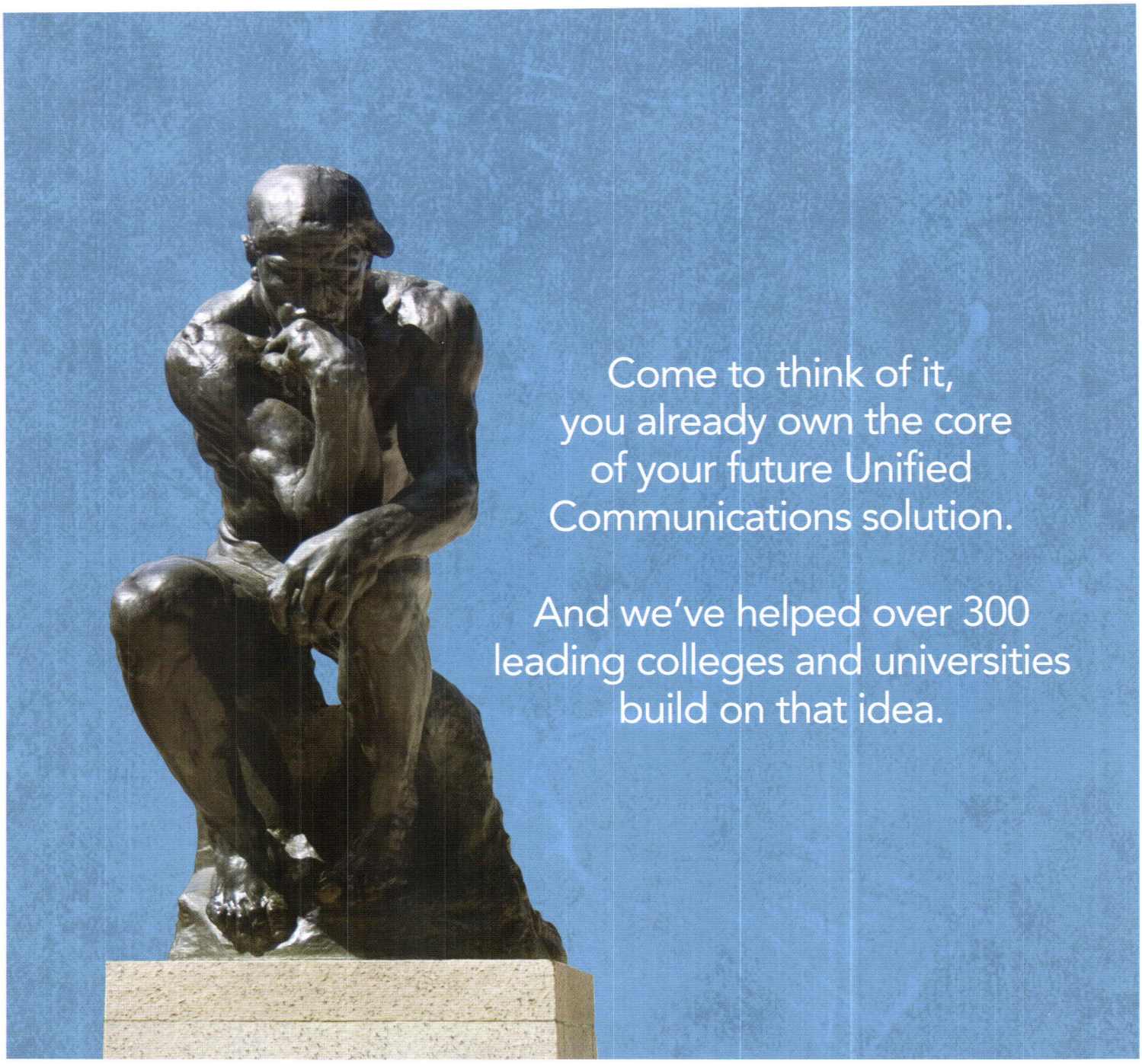
ACUTA Journal

of Information Communications Technology in Higher Education

Published by The Association for Information Communications Technology Professionals in Higher Education



This Issue: Supporting the Converged Campus



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- Encouraging and facilitating networking and the sharing of resources
- Exhibiting respect for the expression of individual opinions and solutions
- Fulfilling a commitment to professional development and growth
- Advocating the strategic value of information communications technologies in higher education
- Encouraging volunteerism and individual contribution of members

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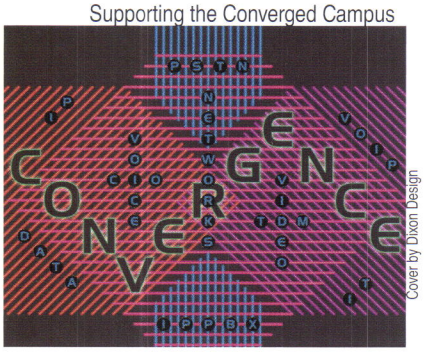

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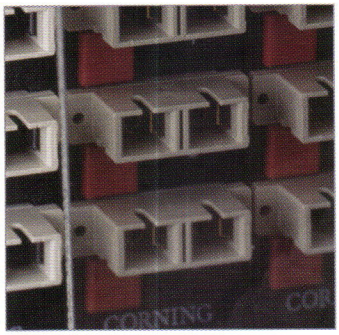

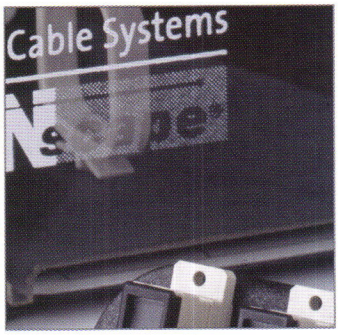

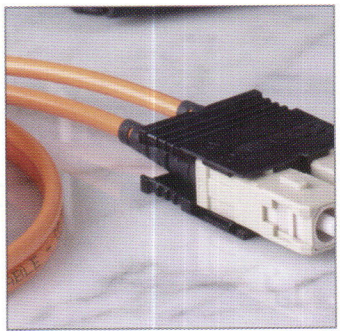

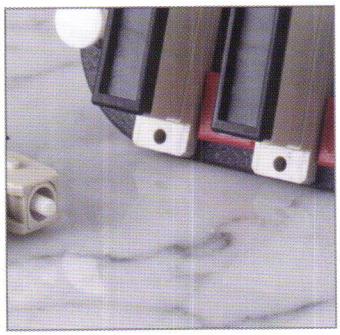

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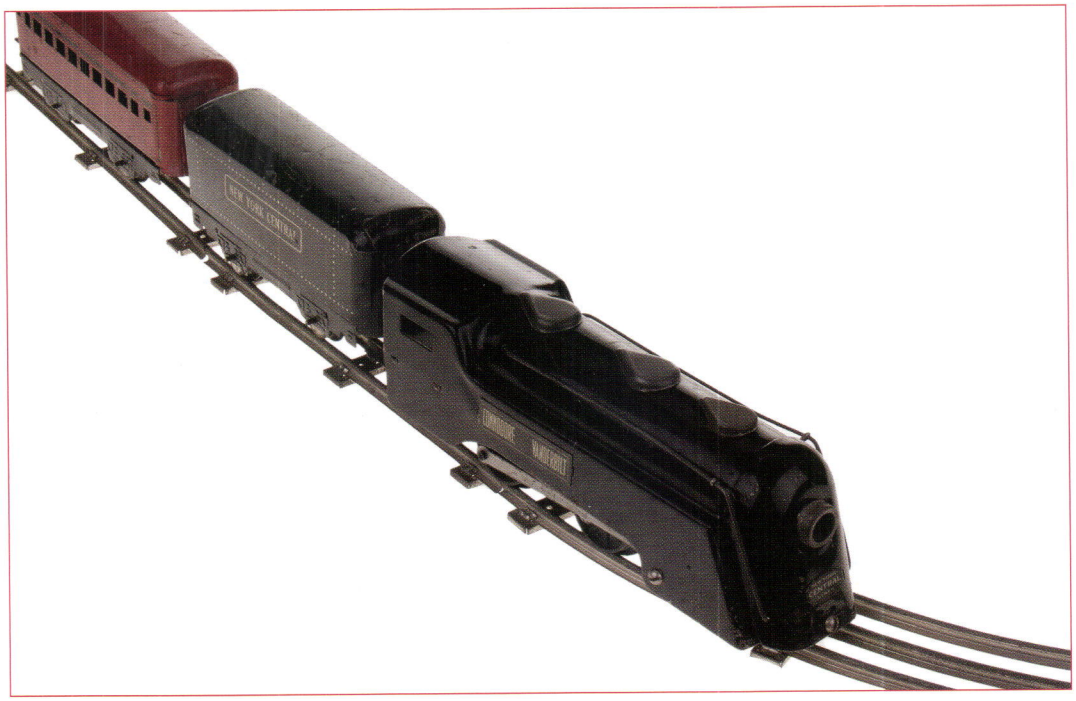

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Eventually, schools will outgrow their infrastructure. At that point, they are faced with expanding their increasingly obsolete TDM infrastructure or moving to something more efficient. Today that "something" is IP-based networking.

Curt Harler
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Published Quarterly by
ACUTA: The Association for Information Communications Technology Professionals in Higher Education
152 W. Zandale Drive, Suite 200
Lexington, KY 40503-2486

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Submissions Policy
The ACUTA Journal welcomes submissions of editorial material. We reserve the right to reject submissions or to edit for grammar, length, and clarity. Send all materials or letter of inquiry to Pat Scott, Editor-in-Chief. Author's guidelines are available upon request or online at www.acuta.org.

The ACUTA Journal is published four times per year by ACUTA, a nonprofit association for institutions of higher education, represented by communications technology managers and staff.

ISSN 1097-8658

POSTMASTER, send all address changes to:

ACUTA
152 W. Zandale Drive, Suite 200
Lexington, KY 40503-2486
Postage paid at Lexington, Kentucky.

Visit the ACUTA site on the World Wide Web:

http://www.acuta.org

Membership and Subscriptions
Subscriptions are provided as a benefit of membership. The publication is available to nonmembers for $80 per year or $20 per issue. For information, contact Michele West, Membership Services Manager, 859/278-3338, ext. 222, or e-mail mwest@acuta.org.

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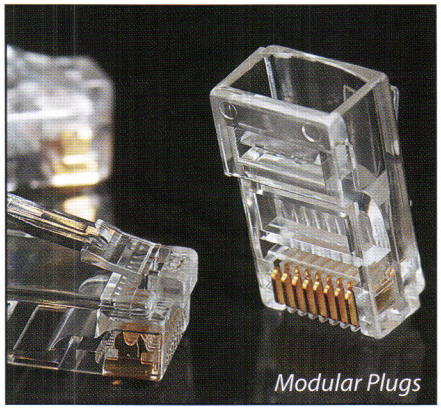
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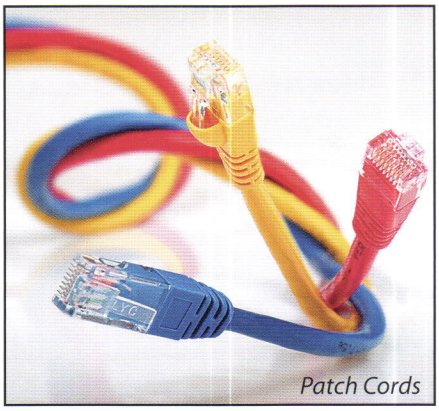
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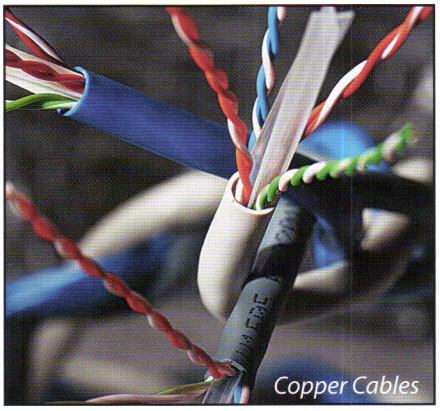
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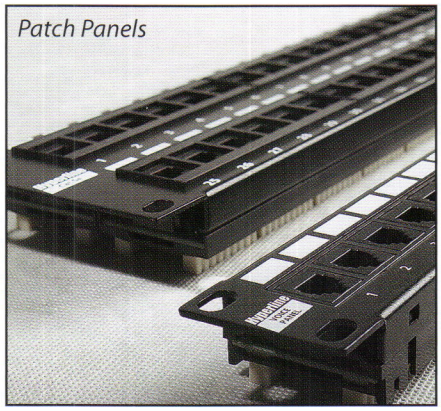
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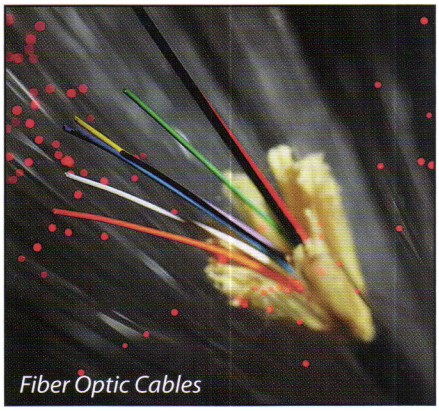
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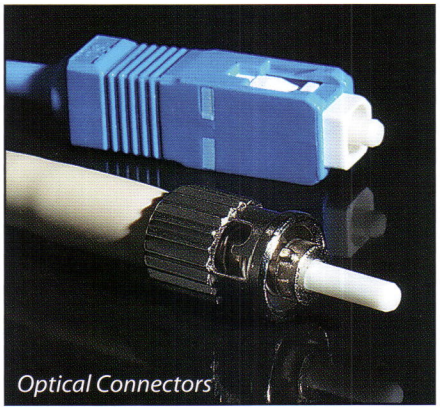
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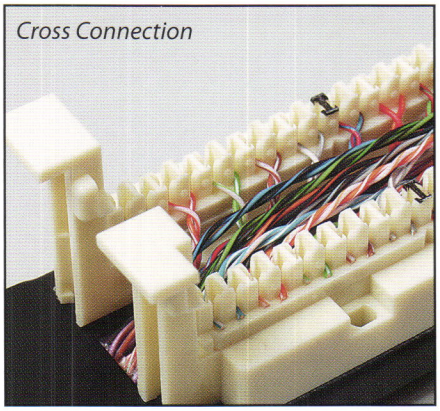
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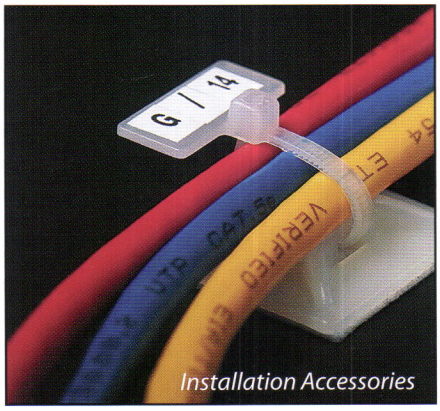
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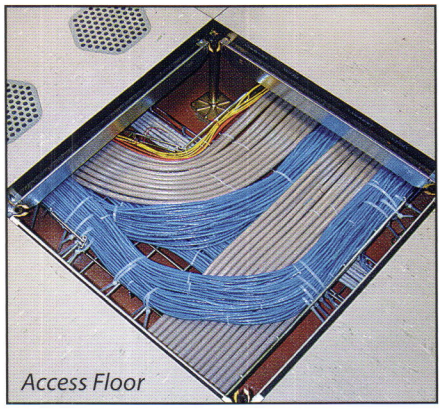
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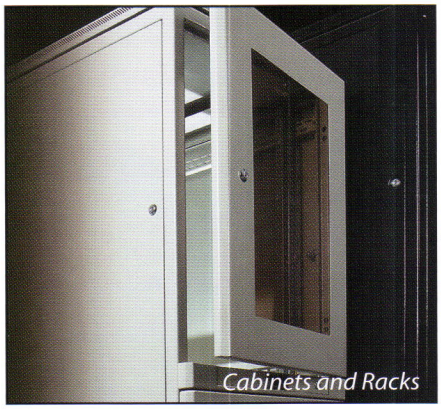
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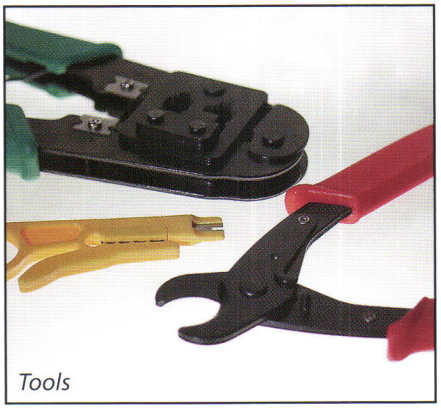
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PRESIDENT'S MESSAGE

WALT MAGNUSSEN, PH.D.
TEXAS A&M UNIVERSITY
ACUTA PRESIDENT
2007–2008

Two Keys to Customer Satisfaction

Several articles in this Journal discuss the technical issues of voice convergence—such things as how to deal with 911 when your users are mobile, what's the best way to handle powering the telephone instruments, dealing with a converged staff, and other items key to a successful implementation.

There are also a few more subtle issues that, while not as widely discussed, are just as key if you are going to keep customer satisfaction at a high level. Two of these issues are *setting customer expectations* and *establishing a dynamic performance monitoring system.*

Let's look first at setting customer expectations. Many of us have decades (more than I personally care to admit to) of experience in implementing key system and digital PBX handset solutions. We know what our customers want and how to deliver it. We know how to match our customers' needs with the most appropriate solution. The drawback to having this knowledge is that often we don't drill deep enough to understand what the customer is actually trying to do.

Migrating to an IP-based platform such as VoIP is actually a revolutionary rather than an evolutionary transition. The problem is that we have an opportunity to do many things differently, but our previous experiences force us to keep returning to where we have been. As a result, we take the VoIP systems and try our best to make them appear to be a TDM solution implemented over a data network. As long as we keep thinking like this, we will never unleash the true potential of an all-IP infrastructure.

An example of this was a department on our campus that was recently facing a move. From initial discussions, it appeared that we would need to go with a key system since an intercom system was a requirement but is not an inherent feature of our VoIP solution. After spending some time with the customer to find out what they were really trying to do, we found a SIP-based solution that met all of their requirements, and we have a satisfied customer. The key to this is that the customer knew that the operations would be different from what they were used to, but because they *expected* a change, the resistance to it was minimized.

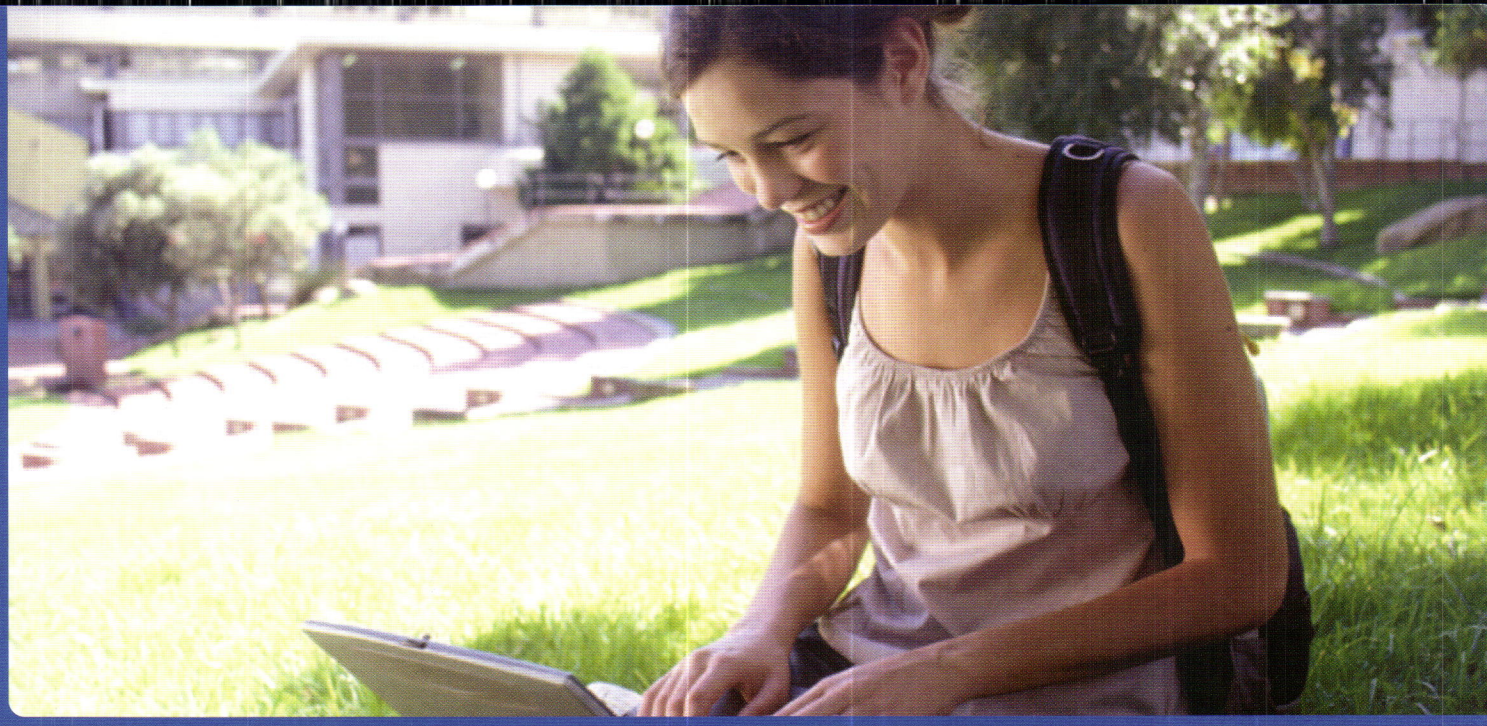
Expectation factor has to be one of the key considerations in deciding if you are going to use one of the H.323-derived protocols for your VoIP solution such as those supported by Nortel, Cisco, and Avaya or you are going to implement a SIP solution. The advantage to the proprietary solutions is that the feature sets are much richer and more closely allow you to emulate the traditional TDM solutions. This minimizes the customer change required, reducing customer resistance (an arguably good thing).

On the other hand, a standards-based SIP solution allows you to implement multiple vendors' handsets on the same platform, allows you to reduce costs, and often lets you implement solutions even if your chosen vendor has not placed the service on their roadmap. The drawback to the standards-based solution is that you are limited to using only features that have been approved by the standards body (IETF). Again, in this case, working with the customer to find out what their needs are will often let you know quickly if the reduced feature set will meet all of their needs. I have found in most cases that it will.

The other area requiring special attention when maximizing customer satisfaction involves *proactive monitoring of network quality.* The problem is that network impairments will cause voice quality degradation. To help quantify the amount of network degradation that is acceptable, the ITU-T has published guidelines in their G.1050 specification.

Since every converged network is going to have issues at one time or another, it is important that there be tools in place that will provide proactive notification of the problem. Unfortunately, most of the more traditional IT network-monitoring tools report whether the network is up or down or what the total level of utilization is and not issues that are specific to real-time applications such as packet loss, latency, and jitter. Nemertes Research recently released a white paper that discussed the value of specialized performance tools that monitor performance. They were even able to estimate the cost savings per handset when these tools were implemented.

The convergence of applications on campus has come of age. The great news is that the tools that we need to manage them and the skill sets needed to do so have kept pace with the rapid changes in the technology.



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From the Executive Director

Jeri A. Semer, CAE
ACUTA Executive Director

ACUTA Board Adopts an Ambitious Strategic Plan and a New Tagline

The ACUTA Board, committees, and professional staff have been engaged in an extensive strategic planning process that began last fall. This winter, the Board of Directors approved a number of goals and strategies and challenged the committees and staff to develop action items for achieving the highest priority strategies over the next 12 to 18 months. In June, the Board will consider a budget for FY 2008-09 that allocates funds for these action items, empowering the organization to move forward with an ambitious plan to continue ACUTA's position of strength and credibility in the higher education community and increase ACUTA's value to our members.

I would like to commend the many volunteer leaders and members of our staff team who took time away from their day-to-day responsibilities to devote their energy, creativity, and insights to the future of ACUTA. Through this process, we examined our strengths, our capacity in terms of human and financial resources, and areas in which our members have expressed needs from the organization. We also thought about the larger higher education community and how we might collaborate more effectively with various organizations to achieve mutual goals and increase value to members.

I believe that the plan that resulted from this intense effort will serve ACUTA members well over the next three to five years. The plan focuses on our many strengths—the reasons for our continued growth and success as an organization. It also takes into account the changing nature of technology and of our members' roles on the higher education campus. It announces to the world ACUTA's intention to change and grow to meet the needs of upcoming communications and information technology professionals, using the technologies of today and tomorrow to improve service delivery to our members, expanding our educational offerings, enhancing opportunities for peer networking, and increasing our effectiveness in policy and regulatory affairs. The plan also recognizes the importance of good relationships with the corporate community that supplies essential technologies and services to higher education institutions.

One way in which the new plan embraces change in our members' worlds is with an important change in ACUTA's tagline. In 2002, ACUTA became "The Association for Communications Technology Professionals in Higher Education." This transition from "Telecommunications" to "Communications Technology" recognized that our members' roles on campus had changed significantly since our founding in 1971.

Beginning this summer, at the conclusion of the 2008 Annual Conference, our tagline will officially change to "ACUTA: The Association for Information Communications Technology Professionals in Higher Education." The addition of "Information" is subtle but significant for several reasons:

- We exist in an interconnected, global environment. "Information Communications Technology" (ICT) may be a bit ahead of its time in the United States, but it is becoming the accepted terminology for communications technology around the world.
- As networks and technologies converge, traditional telecommunications and IT services are no longer separate and distinct entities.

- ICT is a more comprehensive and accurate description of our members' current and evolving professional expertise. Voice, data, and video communications are all within the scope of our members' responsibilities.

Finally, I am happy to share with you a high-level view of the ACUTA Strategic Plan:

Core Purpose—ACUTA's reason for being:

To support higher education information communications technology professionals in contributing to the achievement of the strategic mission of their institutions.

Core Values—The essential and enduring principles that will guide ACUTA's behaviors and actions:

1. Encouraging and facilitating collaboration and the sharing of resources
2. Exhibiting respect for the expression of individual opinions and solutions
3. Fulfilling a commitment to professional development and growth
4. Advocating the strategic value of information communications technologies for higher education
5. Encouraging volunteerism and individual contribution of members

GOAL A, PUBLIC POLICY: ACUTA will influence and contribute to public policy and regulatory reform that provides a positive communications environment for higher education and the constituencies it serves.

GOAL B, RECOGNIZED AUTHORITY AND RESOURCE: ACUTA will be a credible and authoritative resource in information communication technologies and related issues.

GOAL C, PROFESSIONAL DEVELOPMENT: Higher education ICT professionals will have access through ACUTA to educational resources to enable their success.

GOAL D, MEMBER EXPERIENCE: The ACUTA network of professionals will be strong and the membership experience will be engaging, rewarding, and invaluable.

GOAL E, ORGANIZATIONAL CAPACITY: ACUTA will be organizationally and financially strong and able to seize opportunities to create value for ICT professionals and their institutions.

In future articles and on our website, we will share more details about the strategies and action items for reaching these goals. I am confident that the strategies jointly developed by our Board, committees, and staff will be effective, and that ACUTA will continue to be a viable and valuable organization for many years into the future.

Convergence Concepts Come Together

Thoughts to Ponder when Wrestling with Convergence

Curt Harler
Contributing Editor

On college campuses, not all networks are "converged" networks. In fact, many are not. Even the more conservative estimates put the number of campuses still using TDM at more than 50 percent. There is good reason for that. TDM is a robust, proven technology. Institutions invested a lot of money in TDM, and network managers feel comfortable with it.

However, every college that owns or leases lines (whether copper, fiber, or wireless) must contend with burgeoning growth in demand for bandwidth. Eventually, schools will outgrow their infrastructure. At that point, they are faced with expanding their increasingly obsolete TDM infrastructure or moving to something more efficient. Today that "something" is IP-based networking.

Network convergence, experts agree, is the integration of video, voice, and data on one network—typically on IP. Although there will be powerful advocates of all three areas, it is important to start the convergence process at the right place.

"By definition, it should start with data," says Eric Nelson, a director at Alteritech. He notes the reason is that data networks serve as the foundation for converging the other services. And he has no doubt that colleges should look closely at the potential benefits of convergence.

Those benefits go beyond academia. Amy Floyd, director of higher education marketing for AT&T, says that campus safety has become the number-one driver for converged networks at many schools. "The university has to be able to reach all of its community should something happen," she says. "Disaster recovery and business continuity are keys, as well." Services—like online registration, class scheduling, and distance learning—play a big role, too, she says. Given that, why isn't everyone on the convergence bandwagon?

University communities are unusually resistant to change, and unusually persistent in looking for reasons to revert to the "good old way it was," Nelson says. Glitches in the move to the converged network will happen but should not be allowed to submarine the project. "Services will break, phones will not work, videoconferences will fail; these things will happen as part of these kinds of projects. This is why it is important to test it first on a smaller group, rather than the entire community," he says.

The converged network is inevitable because the cost savings are compelling, Nelson continues. That does not mean, however, that he is a proponent of going whole hog with convergence.

"I would recommend breaking it into manageable components," Nelson says. "Start with a small proof of concept, learn, and then go for it!"

Depending on the college's size and culture, the complexity of its applications, and the geographic setup of the actual campus or campuses, the move to a converged network can take months or it can take years.

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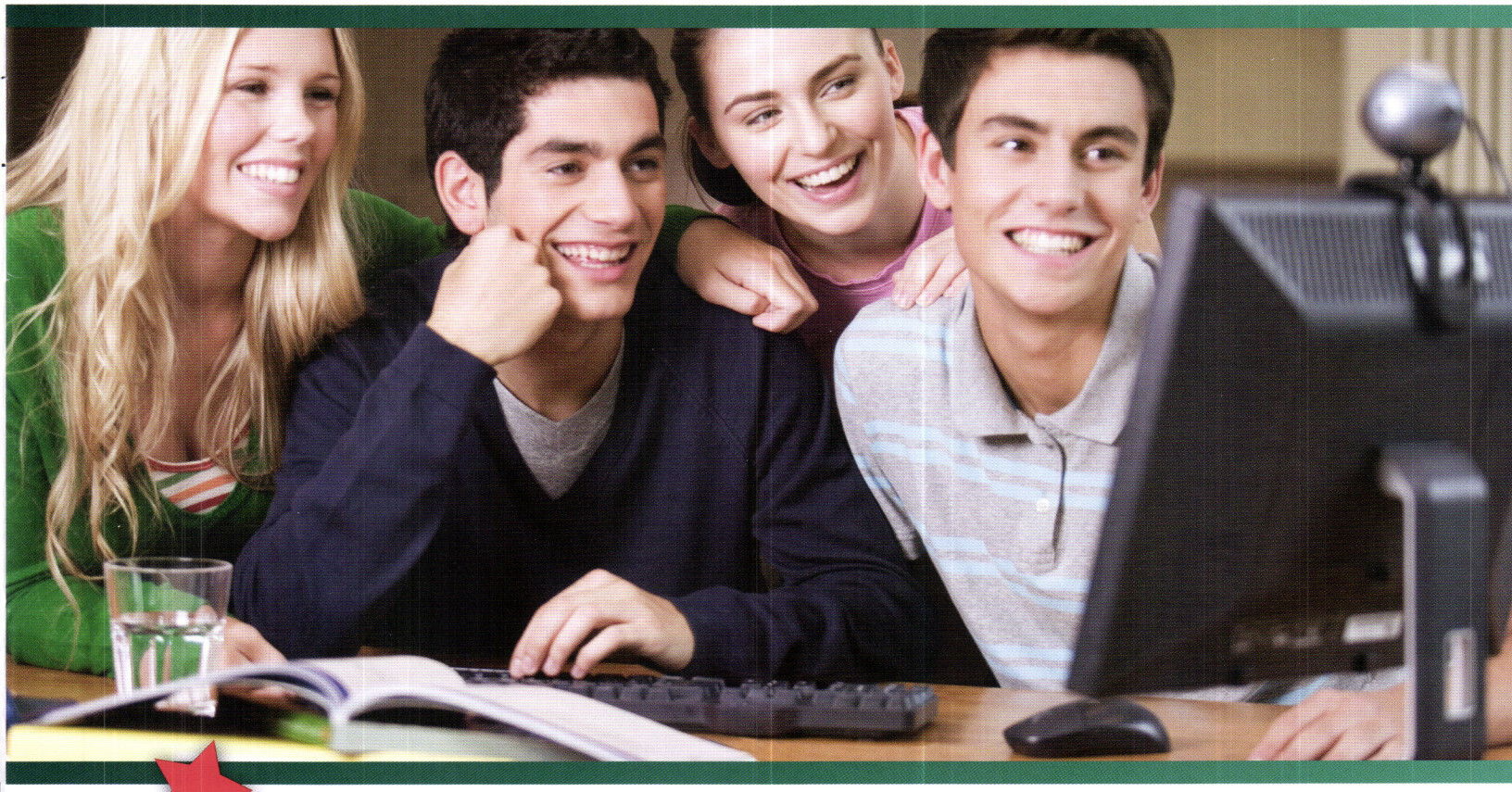

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"Given all that is happening at most campuses, can you afford to be on a legacy system?" asks Igor Glubochansky, director of higher education industry solutions for AT&T.

One trap that often slows a school's move to network convergence is arguing over who should be in charge of the process—the data manager, the voice manager, or someone outside who can moderate differences.

"That's missing the point," Nelson argues. "In the converged world, these are one and the same. It is true, however, that this combination of skill sets does not typically exist in the same person. But at the end of the day, it's all about IP, and the person who understands IP the best is going to be the data guy."

Not everyone would give the driver's seat by default to the data side. "Who drives the convergence depends on the capability of the people involved," says Rick Cunningham, vice president and general manager for strategic markets at PAETEC. However, he notes that the reality of the situation is that the person with a good IP background will have the upper hand. "You are moving to a data-type technology anywhere along the line from analog to digital to IP."

Cunningham says there should be a reason for converging networks. He recalls the story of the president who steps off a plane after reading an article in the airline magazine about convergence and then asks everyone why their school is not doing it. "Don't get involved in convergence for convergence's sake," he says.

There are plenty of good, practical reasons for convergence, he says. He notes the ease of administration, with a single network element. There can be a common support structure for the end user and a single system to manage.

"A converged network is more flexible from an applications standpoint," Cunningham says. "VoIP has more applications than traditional TDM."

"What are you waiting for?" Nelson asks. "Identify the investments you need to make in upgrading your layer 2 and 3 networks and in your monitoring tools," he suggests. Most of all, he adds, "Get started!"

That means identifying the challenge you are trying to address—whether to solve a problem, deal with technology that is becoming obsolete, or serve a greenfields project. Identifying the challenge will point to a good place to begin a project. "If your voicemail is near end-of-life, that is a great place to start," Cunningham says. "Or if you are updating routers, switches, and hubs, start there. Just don't do it for the sake of doing it."

Sometimes the need for convergence finds the network. A faculty research network will prove insufficient to new demands. Or a department gets a grant—and discovers its legacy services keep it from partnering on the project with other schools.

A converged network makes a good marketing tool, too. Parents and students can be swayed on the admissions decision by a powerful demonstration of an integrated network. Never overlook student expectations and needs. In fact, students drive much of what is happening in the converged network.

"The question comes down to defining what is driving the need for convergence," Floyd says. It may be enough to maintain a hybrid network, or the situation may demand going all the way with IP. There is a middle path, too.

The Middle Path

Money comes up again and again as one of the major objections to going the converged route. Not only will it cost money for new IP equipment as a school moves to a converged network, but there is also the potential loss of a good-sized investment in the installed base of still-functional TDM equipment. Right now the market for used, traditional telecom equipment is declining.

The solution might be to run IP over the TDM network. Sounds simple, but it isn't. Keep in mind that packet networks are typically asynchronous and therefore don't carry the timing information needed by the far-end TDM equipment. In addition, packetization delay, network delay, congestion, and jitter may introduce much higher end-to-end delay than TDM networks. Packet-switched networks are more efficient than TDM networks because of their bandwidth sharing, but it is the sharing that makes them nondeterministic. TDM networks, in contrast, are highly deterministic. Circuit delay through traditional networks is predictably low and constant, thanks to static allocation of bandwidth resources.

Because IP networks were designed for the transport of arbitrary data, TDM-related signaling is not supported. Packets entering and transiting the network must compete for bandwidth and switch/router ports, leading to packet delay variation and lost packets. A source device may inject packets into the network at regular intervals, but the network offers no guarantee that those packets will arrive at the destination device spaced at the same intervals, in the same order.

Several firms offer products that leave the end-user equipment and protocols intact, tunneling TDM traffic through the packet network. Pseudowire from RAD Data Networks "emulates T1/E1, T3/E3, and Nx64 links by adapting and encapsulating the TDM traffic as it enters the packet network," according to RAD vice president Larry Jacobs. Adaptation involves modifying the payload so it can be properly restored as it exits the network, TDM signaling and timing can be recovered, and a certain amount of packet loss can be accommodated. Three basic "standards" are associated with the technology: TDMoIP (time division multiplexed [data] over IP), SAToP (structure-agnostic transport over packet), and CESoPSN

(circuit emulation services over packet switched networks).

"I rarely tout product, but this is the real deal," says Stephen Sproul, manager of IT Infrastructure Operations at the University of California–San Francisco (UCSF) Medical Center. About three years ago, UCSF started a move to full VoIP telephony. Part of the project involved Pseudowire.

"This let us beef up the bandwidth between legacy sites," Sproul explains. While UCSF is now moving forward to true SIP to SIP with a Siemens switch, and even playing with VoIP wireless, he recalls the Pseudowire as a key part of their success.

The encapsulation involves placing the adapted payload into packets of the format required by the underlying packet-switched network technology, such as UDP/IP, MPLS, and pure Ethernet.

A TDM-over-IP setup can utilize several different adaptation techniques, depending on the TDM traffic characteristics. Whenever possible, it draws on proven adaptation mechanisms originally developed for ATMs, which offer simplified interworking with circuit emulation services carried over ATM networks.

For statically allocated, constant bit-rate TDM links, ATM adaptation layer 1 (AAL1) is used. This segments the continuous stream of TDM data into small 48-byte cells and inserts sequencing, timing, error recovery, and synchronization information into them. Any number of AAL1 cells can be concatenated into a packet, facilitating flexible trade-offs of buffering delay for bandwidth efficiency. Buffering delay decreases, with fewer cells per packet, whereas bandwidth efficiency increases, with more cells per packet, because of the per-packet overhead.

For dynamically allocated TDM links, whether the information rate varies due to activation of time slots or due to voice activity detection, Pseudowire employs ATM adaptation layer 2 (AAL2). This buffers each TDM time slot into short minicells, inserting the time slot identifier and length indication, sequencing, and then sending this minicell only if it carries valid information. Minicells from all active time slots are concatenated into a single packet.

For time slots carrying high-level data link control (HDLC) data, such as data for common channel signaling (CCS), a special adaptation is provided that saves bandwidth by suppressing idle flags, Jacobs says.

That is the approach they took at the Medical Center and School of Medicine at UCSF. The IT department linked all Medical Center sites—including three hospitals as well as 75 offices and clinical locations distributed across three main campuses—onto a single broadband network. Their Unified Network Project runs on a gigabit Ethernet metropolitan area network (MAN)—required for carrying heavy data traffic such as medical imaging files. The original network configuration demanded 35 point-to-point T1 lines for delivering voice traffic between the sites.

"With new technologies such as VoIP available, we wanted to save the cost of the leased lines by also sending the voice traffic over gigabit Ethernet," explains Sproul. They tested several VoIP solutions, but the experiences were "a nightmare," according to Sproul. "The VoIP equipment didn't work with our legacy equipment. We already had a dependable voice network in place, which we wanted to continue using."

When Sproul heard about RAD's TDM-over-IP solution, he decided to conduct some tests. UCSF Medical Center installed RAD's Pseudowire multiplexer at its eight main network locations, with backup units to ensure full redundancy. "We happily disconnected the 40-plus T1 lines we were using for voice, for annual savings approaching $200,000," claims Sproul. The modular network design enables the IT department to deploy additional communication links between buildings, as needed.

"I am pleased to report that all our voice traffic is running over our high-speed gigabit Ethernet MAN," he says. "Performance thus far has been outstanding. In three years we have had a total of two trouble tickets opened—and both of them were caused by human, not equipment, failure.

"It works so well that we've had to retrain our people on the system—they'd forgotten how to program it," Sproul says. "The equipment is working seamlessly with our legacy network, which includes Cisco routers and Siemens HiPath PBXs that use an intermachine protocol called CORNET," he adds.

"Our blockage is under one percent," he adds (typical on a network is about six percent). He is especially happy with the lack of trouble tickets: Two in three years contrasts with the two per week one might expect on a T1-based network with the 58 trunks UCSF now has on its legacy system.

Kicking Off a Project

Not everyone will be as far along as UCSF. When the time comes to begin convergence, Nelson recommends starting with one community (administrators, faculty, students) and breaking that down by application (first messaging/e-mail/voicemail, then VoIP, etc.).

He says the fundamental approach is to think by application. "But try it out on your IT staff first, fix the problems, then roll it out," he advises.

That approach is the right way to go, Cunningham agrees. "Start small, in a controlled environment with a group that understands technology and is willing to test technology and prove it out," he says. ▸

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"No matter how well you plan, you'll forget some things," Cunningham continues. "Start small, learn from any mistakes, define your processes. Then expand as needs dictate."

Adding video and/or voice to an IP network, for example, requires the execution of several well-documented readiness steps/checklists, Nelson notes. "This is no longer cutting-edge technology, but it is leading edge and therefore requires careful planning and execution," he says.

"Planning goes beyond the telecom director," Floyd says. "You need to have the CIO and CTO involved, along with the telecom and datacom managers," she says. "Someone at the CTO level should be aware of what initiatives are under consideration around campus."

Although the finished product of a converged network is a good marketing and practical tool, the news that a campus is migrating to a converged network is irrelevant to the community at large. "What is relevant is the introduction of new capabilities (e.g., unified messaging) and the necessary training to recognize the return on that investment [ROI]," Nelson says.

Some projects—say, a single converged application or service—can be executed in a matter of a month or two. In contrast, re-cabling a campus and moving to a hosted environment should be planned in terms of years.

AT&T's Glubochansky agrees that the time frame will vary greatly. "Migration from a TDM to an IP PBX can be done in a matter of months," he says. "But if you are migrating a complete set of applications, you are looking at a three- to five-year horizon."

Driving Forces

Voice people often are intimidated by the move to a converged network, but it does not have to be that way.

When the concept of a converged network first came out, everything appeared to be data oriented.

"Years ago, there was concern on the voice side," Cunningham says. "But now that we are into deployment, some of the principles on the voice side are coming to the fore," he notes.

One major advantage for the voice trained is their commitment to uptime. The traditional solution from data people to many data problems is simply to reboot. "With voice people, there is a whole different level of quality expected," Cunningham says. "Voice demands 24/7 service. The data world is gaining a new appreciation for the standards and practices followed in the telecom world.

His advice, whether convergence appears imminent or not, is to become knowledgeable about convergence. "Build your educational background with organizations like ACUTA," he suggests. "Use the resources and experience of others. Learn from their experiences. Develop a good argument both for doing it and not doing it. You can be sure that, one way or the other, it is going to come up."

Everyone seems to agree. "Planning is the key," Floyd says. "Once you get buy-in on a convergence project from the higher administration, you will get the funding," she says. "Give them a strategic plan outlining what the various departments will do with the technology. But, she concedes, funding will never be a smooth ride.

Any plan must include costs. Nelson is not being cynical, just practical, when he advises to set the convergence budget for more than you expect and more than the vendors lead you to believe. "These initiatives are fraught with hidden costs. But they are still compelling ROI when they are all said and done," he concludes.

Glubochansky agrees. "Look at the ROI over a period of months or years. Look at cost management, functionality, features," he suggests. He notes that there are grants for projects that will enhance campus security. "That's often where convergence starts—getting a grant for a project that will not work on the existing network. It can be security. It can be a potential new, cool, high-impact student service."

Cunningham says there will not always be the big dollar savings that everyone expects. "People always cite economic reasons for convergence, but it will not always be cheaper in the long run," he says. Especially with smaller, single-campus colleges, the payback might be more in flexibility than in cash. Larger colleges, those with several small satellite locations or international locations, will find that the converged network fits nicely and will give dollar savings.

Convergence really started many years ago in the technology and maintenance departments when they started issuing trouble tickets and work orders. Next public safety embraced IP-based wireless to track license plates from patrol cars. Now everyone wants wireless access from everywhere on campus.

"There are one million students at four-year schools," Glubochansky points out. "Students and faculty already are using wireless, IP phones, wireless e-mail and other technology that benefits from convergence. We are learning that the converged network improves safety as well as the educational environment and makes for a better community."

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Planning Convergence at FSU

Michael F. Finneran
dBrn Associates, Inc.

"Convergence is going to happen, either *to* you or *with* you." In one sentence that's how Harvey "Buck" Buchanan, director of the Office of Telecommunications (OTC) at Florida State University (FSU), summarizes his view of integrated communications. A 28-year veteran at the school and with 10 years in the director's role, Buchanan has no illusions about the scale of the task OTC faces. He is a firm believer in the philosophy that if you spend your time looking back, you're not moving forward.

"Today we face a need to squeeze more traffic onto our networks," says Buchanan. "We're being asked to take our traditional local analog telephone loops (up to 15,000 feet), coax video systems, and legacy applications and convert them into a single converged network interface that ultimately gets delivered on an Ethernet drop with a maximum range of only 328 feet. This shift moves our legacy networks from a proprietary environment (e.g., voice TDM, cable TV) onto one shared network. We are going from being the only fish in the pond to one of many fish in the pond. Our former dedicated traffic streams have become just one more packet among many packets trying to better utilize bandwidth on a shared network. We all know the technical buzzword: convergence."

FSU is the 22nd-largest university in the country, offering undergraduate, graduate, and professional programs for roughly 40,000 students. With a full-time staff of 75, Buchanan and his team are responsible for an extensive campuswide backbone supporting approximately 25,000 attached devices. The university includes 16 colleges and operates a residence hall system that provides on-campus housing for 6,200 students. Along with running the combined campus technical help desk, OTC manages voice, data, wireless, access control/security, and video networking systems for approximately 105 main campus buildings.

To prepare for convergence, the IT structure was reorganized in June 2005, moving OTC under the Office of Technology Integration division as part of a new organization reporting to the university's chief information officer. At the same time, OTC maintained its traditional ties for auxiliary operations under the Finance and Administration Department and now reports jointly.

Campus Infrastructure

Associate director for Operations and Technology Charles Friedrich explains the development of the core FSU infrastructure philosophy following the reorganization: "Our goal was to have all departments on a level playing field and to be sure that funds were applied to identified projects with objectives that benefitted the most users."

The first challenge that OTC faced was defining a clear point of demarcation between centrally managed services and department-managed services. In some cases the departments owned the entire building data infrastructures, while others required complete support from OTC. The various departments and schools within FSU had differing levels of IT expertise and funding, and as a result they took different levels of responsibility in maintaining and operating their in-building networks.

To help clarify ownership, set expectations, and improve network management capabilities, OTC began a campuswide

program to install uniform state-of-the-art building entry switches (BES) from Foundry Networks to serve as the building demark to the core network. The program was called Smoothing the Edge. Highly successful, the program is now in its third phase, with almost every fiber-enabled building on the campus connected via a BES switch.

The core network, managed by associate director Don Pace, consists of nine Cisco 65XX routers connected over a redundant, fiber-based 10 Gbps resilient packet ring (RPR). While *smoothing the edge,* the OTC team upgraded the available bandwidth to all the fiber-enabled buildings from 50 M-100 Mbps to 1 Gbps. The goals of the BES program were to increase inter-building bandwidth to 1 Gbps, install additional fiber-optic connections across the core, implement new management tools, upgrade UPSs, and increase the core network transport to 10 Gbps. The overall result was to improve network response and management capabilities while making FSU's core network "utility grade" (a.k.a., 99.999% uptime).

Another key feature of OTC's converged network approach was developed as it worked with its user departments to determine their support needs. At one end of the spectrum, there were user departments that interconnected to OTC's campuswide core network at the BES and could take care of all the in-building LAN infrastructure equipment (excluding wiring) on their own. However, if a department didn't have the expertise required to support its own infrastructure, it could enter into a Service-Level Understanding (SLU) with OTC, which would then provide service and support all the way to the wall plate. These SLUs cover switch hardware/software, UPSs, limited wireless LAN access points, patch cords, network monitoring, and life cycle replacement. Now about 9,000 of the university's 25,000 ports (roughly one-third) are handled under SLUs.

The TDM-based voice network is currently provided on a Nortel Meridian MSL-100-based digital Centrex network supplied by the local telephone company, Embarq, and managed by OTC. The carrier-grade class-5 end office is physically located on the FSU campus and supports approximately 10,000 lines.

With its campus infrastructure now moving forward, OTC is embarking on its first production trial of an IP PBX, a Nortel CS1000E. The IP-based system has 200 stations supporting OTC and University Computer Services personnel in two locations. To date, the deployment of the VoIP services have been well accepted and technical problems have been few. OTC has found differing levels of interest concerning unified communications applications among the various schools, but their deployment will come down to finding a sound business case or the "killer application," whichever comes first.

Other Key Network Elements

All students, faculty, and administrators have access to FSU's wireless LAN, which includes about 380 stand-alone 802.11 access points, 21 high-capacity arrays, and an additional eight legacy 802.11 panel antennas serving outdoor areas on the campus. The WLAN network supports 802.11a/b/g devices today, though OTC is looking into 802.11n support. "On-campus wireless use is growing exponentially," says Friedrich. "We are approaching wireless deployment and management with the same philosophy as the core network upgrade. The goal is to improve management and security and update technology while following a well-thought-out plan."

OTC also operates the university's cable TV system. It receives a bulk fiber feed from the local cable company, filters some of the channels, and inserts six additional channels in its own headend. The bi-directional system, called Seminole Cable Vision (SCV), delivers 70+ analog channels plus two HBO channels. A converged network will enable such applications as IPTV for educational video and, one day perhaps, IPTV for entertainment video as well.

OTC's assistant director, Colleen Henderson, manages the campuswide card access/security systems and closed circuit TV (CCTV) systems. Access/security systems are installed in more than 63 on- and off-campus buildings, with 689 electronically controlled doors and a total of 2,051 monitored inputs. All those are supported on either dedicated switch ports or VLANs running over the new building entry switches to the core network. That represents a significant upgrade from the preconvergence RS-232 and dry-pair network used only a few years ago.

The campuswide security video camera system (CCTV) is also being steered toward the converged network. Given the distances involved in many of the CCTV camera runs, a traditional coaxial cable–based system is deployed today rather than IP video. However, as more buildings are retrofitted with upgraded pathways and new network switches, IP video cameras are starting to be deployed. Buchanan adds, "Our goal is to one day have all IPTV cameras across campus with an enterprisewide network video recorder system. The real success has come from working with the FSU chief of police to determine policy and deployment requirements. The Florida State University Police Department has been an ideal partner in working through the operational issues."

All the systems mentioned above run over FSU's ever-growing outside plant infrastructure composed of approximately 7 miles of underground duct bank, with 150 manholes connecting the 105 campus buildings over the 400-acre campus. This system contains 38 miles of fiber-optic cable, 50 miles of copper cable, and 5 miles of coaxial cable supporting voice, data, CATV, security, and building entry systems.

For Internet access, FSU is one of 10 equity members in Florida Lambda Rail (FLR). FLR has deployed more than 1,540 miles of dark fiber and provides a dedicated statewide communication facility with nodes located throughout the state. The foundation of the infrastructure is a dense wave division multiplexing–based optical footprint using Cisco 15454 optical systems with a capacity of 32 wavelengths per fiber pair. Each wavelength can support transmission rates of up to 10 billion bits per second (OC-192), or a total of about 320 Gbps per fiber pair. As an equity member, FSU is connected with a primary 10 Gbps access and a secondary 1 Gbps connection to the MPLS-based fiber backbone.

Preparing for Convergence

Interestingly, when asked about network integration, Buchanan talks more about people than he does about technology. An experienced network manager, he acknowledges that change doesn't happen quickly, and a manager has to recognize the differences among people in the department. Having worked in both voice and data networking, Buchanan can see both sides and readily acknowledges the differences in background between voice and data technicians.

Buchanan went on to explain, "The technology to do convergence, while not simple or cheap, is available. However, I suspect the biggest challenge for any organization lies in the areas of shifting business models, organizational blending, operational expectations, and determining where communications really are headed within your particular user community."

Getting the voice and data groups under the same management structure was an important first step, he concedes, but the more important factor was getting the people to "rub shoulders" and come together in a common purpose. The key change, Buchanan points out, is, "When you get down to it, people who eat, drink, and sleep technology are all the same. Once they realize they're on the same team, they don't think turf."

Conclusion

By any measure, the transition to a converged network environment is a major undertaking. Buchanan talks about a core networking philosophy and strategy that was developed to get the OTC staff through this type of transition. Major change requires consensus, and consensus comes from trust. You can't push people into new technologies; you have to guide them into commitments they are comfortable with.

Money will certainly be an issue, and the university is exploring different approaches regarding how the required investments will be funded. It is only when you have achieved consensus regarding the overall goals and a plan to finance the undertaking that you can begin to address the technology initiatives.

Friedrich puts it this way: "Our environment is changing so fast and is so complex that I've told my staff to 'stop playing checkers and learn to play chess'. We have to think ahead and be ready, not surprised. Follow our structure and plans, but allow for flexibility. That's the key."

Recognizing the scale and diversity, FSU is taking a measured approach and has avoided falling flat by trying to push the ultimate solution before the foundation is in place. Convergence will involve a university-wide realignment focusing first on the infrastructure and personnel issues to ensure that the foundations are sound. That done, FSU will be ready to put a sustainable convergence plan into action.

Michael F. Finneran, President of dBrn Associates, Inc., is an independent consultant, industry analyst, and writer. A regular contributor to the NoJitter and UC Strategies websites, he was also a longtime columnist for *Business Communications Review.* He recently published his first book titled *Voice Over Wireless LANs—The Complete Guide* (Burlington, Mass: Newnes, 2008).

Columbia University's Formula for the Future

Organizational Convergence + Network Convergence = Flexibility

Corinne Hoch
Columbia University

The vision statement for Columbia University Information Technology (CUIT), developed and contributed to by the entire staff of vice president and CIO Candace Fleming, is:

> *We lead the delivery of world-class integrated information technologies to advance Columbia University's global leadership in research, teaching, learning, and community outreach. By engaging our team of professionals and collaborating with strategic partners, we enable our clients to achieve their goals and enrich the Columbia University experience.*

We translate that vision statement into our paths toward convergence, emulating the information technology industry's surge toward uniformity. Our objective is to provide simplicity for the client where there once was great complexity, allowing our faculty, students, administrators, and staff to concentrate on the pursuit of global endeavors.

The road to convergence must be undertaken one step at a time, recognizing the value of our IT staff and the relevance of our systems and services to the clients whom we serve. We must never falter in our vision, our direction.

Some of our major steps on this road include the following:

• Winter 2004: Announcement of IT Merger Intent

Two separate technology departments, Academic Information Systems (AcIS) and Administrative Information Services (AIS), received the news of the intent of the university to streamline the provision of technology. We were to become a new, integrated information technology organization, combining infrastructure, applications, user services, and security staff and programs. The result would be a more effective use of IT expertise and resources, allowing for a clarified and coordinated approach to client support.

In preparation for the merger, we were asked to identify synergies within the two areas with the goal of working together in partnership. We looked forward to developing templates to define IT roles, identifying methodologies to improve current business processes and developing an educational plan to communicate the changes.

• Winter 2005: Establishment of Executive Leadership Team and Reorganization of IT

Fleming, who was chosen to lead the new IT organization, was committed to making the new organization work well for the university. She embarked un the journey toward convergence with the recognition that it is an evolutionary, customer-focused, and culture-focused process. An excellent Executive Leadership Team was selected from key areas representing the strengths of the combined organization.

As soon as the Executive Leadership Team was in place and management and staff buy-in obtained, the new IT realignment was announced. We were ready. The combined organization had the scale and the ability to reshape IT. We would soon be able to provide more value to clients through innovative technology offerings, significant service enhancements, simplified business processes, and easier access to information.

• Spring 2006: Organization and Tasks of IT Leadership Council

To collaborate with strategic partners throughout the university, Fleming initiated a joint sponsorship with community stakeholders. She teamed with IT groups across Columbia to help prioritize initiatives, share ideas, and develop

agreements with preferred suppliers, consortia, and peers. Monthly meetings of the IT Leadership Council continue to be held.

The need to capitalize on and grow from the strong relationships that we had with our clients was recognized, reinforced, and maintained.

One of the first major tasks for the Executive Leadership Team was to identify and agree on the many facets within the newly combined area on which to focus time and dollars. Balancing the IT priorities set forth by senior management and the needs identified by the IT managers with the demands dictated by the university community and available funding is a constant challenge. Reviewing the dichotomy on a regular basis is required. The identification of needs is relatively simple, but the inevitable juggling act requires skillful listening, analysis, synthesis, and constant communication.

• Summer 2006: Development of Job Families

Embarking on an organizational development project, we began to develop consistent and standardized job descriptions, career paths, titles, and grades and to assess pay equity throughout CUIT. The project was designed to introduce a work management structure to address those issues and enable the future evolution and management of the new IT workforce.

We realized the following results from this effort:

1. New job families encompassing job descriptions for all positions within CUIT as defined today, with a plan for continual refinement as departments evolve and mature.
2. Clear designation of similar or related jobs, whether within one unit or across multiple units.
3. Clear and consistent titles across CUIT.
4. Recalibrating of grades to appropriately relate job responsibilities to the university's job-grade framework and to ensure consistency and equity across CUIT.

• Summer 2006: Centralized Help Desk and Branding Effort

The design of an elegant navigation strategy to help the university more easily find the technology services and products that it needs is an ongoing process. Some of the steps taken initially were to focus on centralizing our voice and data help desks, increasing staffing, improving the knowledge base, lengthening schedules, and enhancing the infrastructure.

Working with our internal communications area we developed a new look for a new department. Our new name, Columbia University Information Technology, emerged, as did our new logo, our new plan for signage, and improved webpages. Opportunities abounded for us to communicate the promise of our enhanced image.

• Summer 2007: IT Culture Change Workshops

To help us better understand ourselves during the development of the new IT organization, workshops on culture change were held and additional staff development training offered. We all go through identifiable phases during a merger, and it is helpful to know what to anticipate. We are better able to cope when we recognize that our reactions are normal, so we'll be more productive when we are able to take a step away from the day-to-day, often overwhelming, responsibilities. The transition to the new IT organization is easier and accelerated with the intent of improving organizational efficiency while reducing the negative impact of change.

• 2007–2008: Delivery of Enterprise Systems and Enhancements

Maintaining productivity in the new IT environment is certainly one of the measurements of our successfully merged organization, as shown by the list of some of our recent deliverables:

> The identification of needs is relatively simple, but the inevitable juggling act requires skillful listening, analysis, synthesis, and constant communication.

1. New open-source e-mail system (Cyrus).
2. New identity management system and recarding (Lenel).
3. Enhanced open-source course management pilot (Sakaii).
4. Upgraded human resources system (People@Columbia, PeopleSoft).
5. Enhanced Rascal system for HIPPA compliance.
6. Implemented InfoEd grants management system.
7. Improved DARTS reliability and performance (Departmental and Advanced Tracking and Reporting System), the major campus financial reporting tool.

We've Come a Long Way

We've come a long way since September 1955 when Columbia installed the first computer on campus, and even since September 1988, the date of the installation of the first proprietary telecommunications system on campus (integrating voice and data at the station level). In 1988 we also installed the first proprietary voicemail system and the first telephones in residence hall rooms, and replaced all voice and data cabling on Columbia's campus. In December 1999 Columbia announced the development of Session Initiation Protocol (SIP) by Henning Schulzrinne, a Columbia professor of computer science.

Are we there yet? Alan Crosswell, associate vice president and chief technology officer, admits that we aren't but says, "Where we have a good network, we have the flexibility to allow it to respond quickly and efficiently with powerful results."

A Giant Step Forward at the Studebaker Building

The landmark Studebaker Building, one of the first in Columbia's planned northern campus in Manhattanville in New York City, provided the opportunity for us to take a giant step forward toward network convergence. Studebaker would be renovated to offer the first upscale office space at Columbia, housing 700 administrators and allowing us to develop a unique IT model with one common network infrastructure for VoIP, managed desktops, video, data, security, building management systems, and collocated IT support.

Crosswell led the VoIP project team, composed of staff with legacy telecommunications skills and expertise as well as those with good, home-grown e-mail and networking talent. He quickly observed the strength of his team on all sides and leveraged it, noting that the team members worked well together, respecting and learning from each other. He was grateful for the combination of customer focus and openness to new ideas that resulted in a successful VoIP deployment.

The VoIP team designed what it refers to as a survivable IP network with as much diversity as economically feasible, such as outside fiber routes, inside vertical riser fiber, dual power supplies, a diesel generator, PoE, dual switch uplinks, SIP, and a few POTS lines, just in case. Nothing was overlooked in the network design for the Studebaker pioneers.

Because those pioneers were relocating from several different geographic locations, much thought went into planning the transition from various telephone systems. Focus groups were held during the planning process as a way of introducing the pioneers to the concept of one network for everything, soliciting their ideas for features as well as the name of the new VoIP system. And the provision of VoIP service for those who would move to Studebaker months before their actual move resulted in the assurance that anyone would be able to use the phone on the network on the first day of the move.

NetPhone was the logical name of choice for that one network supporting commercial off-the-shelf phones and media gateways on open-source call control and feature servers, voicemail, conference mixing as well as an open-source web-provisioning application.

Printed media emerged on the Web, as quick reference guides, and in *Welcome to Studebaker!* packets in conjunction with the following project time line:

April 2006:	Project initiation
October 2006:	Prototype VoIP service in operation
November 2006:	Feature moratorium
December 2006:	VoIP project staff on early production VoIP

February 2007:	First CUIT staff moving to Studebaker on production VoIP
June 2007:	Production service ready for first CUIT move to Studebaker
August 2007:	HR and Finance Groups move into Studebaker

We attribute the success of the VoIP implementation project at Studebaker to the flexibility attained through organizational convergence, technological convergence, and to the convergence of thought. Our membership and participation in ACUTA, Common Solutions Group, Internet2, and NYSERNet led to collaboration with Cornell, MIT, Northwestern, the University of North Carolina–Chapel Hill, the University of Pennsylvania, and many others.

Conclusion

Columbia has built a reputation for excellence over many years. As we faced the challenges that come with convergence, we applied stringent standards so that our project would contribute to that reputation. This is still a work in progress, but we take pride in what we've accomplished. Our greatest satisfaction, as we look back over the past two years, comes from the realization of our vision:

We are now in a position to *lead the delivery of world-class integrated information technologies to advance Columbia University's global leadership in research, teaching, learning, and community outreach. By engaging our team of professionals and collaborating with strategic partners, we enable our clients to achieve their goals and enrich the Columbia University experience.*

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Assessing and Managing Privacy and Security Risks

Kirk J. Nahra
Wiley Rein

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Privacy and security must be critical areas of concern for any organization that maintains personal information about customers or employees. New laws are being created by the states on a weekly basis. Federal regulators are issuing new rules routinely. Congress continues to debate new federal legislation. Various business groups are releasing "best practices" guidelines or developing binding contractual commitments concerning privacy and security. And courts are being flooded with new kinds of privacy and security claims, all trying to cash in on the almost constant publicity surrounding security breaches, identity theft, and privacy concerns.

These developments all point in the same direction—the privacy and security environment is becoming more complicated, more risky, and more regulated and is having a substantial impact on virtually every company. For some enterprises—those in the healthcare and financial services industries, for example—these concerns are not new (although the overall complexity is growing). For many others, it is now time to realize that these problems are real, that the risks are significant, and that it is time to get a good understanding of the full range of privacy and security issues affecting their organization.

So what can you do to get started? You need a privacy and security assessment, one that permits your institution to evaluate its primary areas of legal obligation and to identify areas that are most likely to create risk. This assessment is not designed to answer all of your privacy and security questions, but it is a good starting point to considering areas of primary concern for your organization.

The key to an assessment is identifying how you gather, store, and disclose personal information about faculty, staff, students, and others. If you were an "unregulated" company—a typical retailer, for example—the goal would be to meet a reasonable baseline of privacy and security standards, as set by the Federal Trade Commission, numerous state laws, and a variety of best practices that apply to personal information, largely independent of business context. If you were a tax preparer, cell phone company, bank, or healthcare company, you would have additional requirements and concerns specific to your business. But any entity (including a college or university) that creates, maintains, or discloses personal information about customers, clients, and/or employees needs to have an approach to dealing with each of the areas identified by this assessment to allow it not only to identify and manage risk but also to take reasonable—and sometimes surprisingly easy—steps to reduce overall exposure.

Conducting an Effective Privacy and Security Assessment

The key goal of a privacy and security assessment is to understand where data exists, where and how it is gathered and stored, and what is done with this data. Many of the security breaches publicized over the past few years have resulted in widespread head scratching: Why did the government employee take 26 million Social Security numbers home with him at night? Why did the regional manager have so many employee records on her laptop? Why were Social Security numbers provided to a vendor running a consumer

satisfaction survey? When organizations conduct these assessments, they can understand what kinds of information exist within their enterprises and what is done with it. This assessment, which should focus on all personal information about faculty, staff, and students, will provide a baseline not only for assessing what laws and regulations are relevant but also for creating an integrated, overarching approach to data protection. Until you know what data you have and what is done with it, you cannot have effective privacy and security compliance.

So what are the key areas to evaluate in your assessment?

Security Practices

While privacy came out of the box first, concerns about information security now dominate the landscape for the protection of personal information. And despite the enormous publicity about security breaches and the increased regulation of security practices, visible security failures are almost constant. This means that increasing and improving security protection for sensitive personal information must be at the top of the priority list for any entity, including institutions, retailers, on-line merchants, banks, schools, healthcare entities, and the rest of corporate America. The challenge of the security component of your assessment is to identify current practices and, more significantly, define gaps where security procedures are not appropriately focused on responding to regulatory obligations and practical risks.

This assessment effort needs to focus on two broad categories of activities. First, everyone needs to recognize the increasing regulation of information security practices, from the Federal Trade Commission's best practices to the new standards imposed for any entity that accepts credit cards. Every business needs to review these requirements and implement appropriate security practices to meet the standards. Remember, security perfection is not required, but failures based on inadequate practices will be visible, prominent, and attacked by a wide variety of constituencies. Also, if your enterprise accepts credit cards, be aware of the new PCI (Payment Card Industry) security standards and the increased contractual commitments your bank and credit card company likely will seek from you with respect to your security practices.

Beyond these overall compliance requirements, businesses next need to focus on practical employee training and developing an effective overall security program. This program needs to recognize that security is not just about controlling your computer network. Security breaches encompass a wide range of problem areas, including not only hackers but also paper files, lost data tapes, and various physical security measures. Since many of these areas are outside the domain of an information technology department, the first challenge for many enterprises is figuring out who should run an overall information security program.

In addition to these programmatic efforts, individual behavior can greatly affect information security. Whether it is enforcing password requirements, dictating new practices for the protection of laptops, or simply teaching employees how to protect

information (and how to stay away from sensitive information that is not legitimately part of their work), effective and practical training can go a long way toward reducing security risk.

Core Privacy Issues

Beyond many of these security practices, a wide variety of substantive privacy laws restrict how specific kinds of personal data can be used and disclosed. The healthcare privacy rules (HIPAA) and the financial services rules (from the Gramm-Leach-Bliley Act) are two of the most prominent. In addition to these industry-specific legal requirements, there is an emerging array of best practices for the collection, use, and disclosure of personal information across industries, which are supplemented by additional context-specific requirements. Your privacy assessment should be designed to help you identify the primary uses and disclosures of personal information, so that you can concentrate on the relevant rules and best practices applicable to colleges and universities.

One of the key areas of concern for many businesses relates to how customer information is used for marketing purposes, both by the company that initially collected the information and by others to whom the information is disclosed. Accordingly, while the standards vary somewhat by industry, most companies conduct marketing activities that require compliance with, and awareness of, the numerous marketing-related privacy rules.

In many ways, a desire to restrict marketing activities has been driving many of the most prominent privacy rules. Furthermore, Congress and federal regulators (along with their state counterparts) continue to struggle with what the dominant privacy principles should be. Nonetheless, companies need to assess their marketing activities to determine whether they trigger compliance obligations under any of these privacy principles.

The most prominent marketing rule is the "Do Not Call" list, enforced primarily by the Federal Trade Commission and the Federal Communications Commission. This highly visible and supported rule creates substantial compliance obligations for any enterprise that conducts telemarketing activities of any kind, encompassing not only the overall Do-Not-Call List, but also the development of a "company specific" do-not-call list for existing customers. The law requires significant monitoring and training of agents as well, whether telemarketing firms or others that may be selling your products for you. The fines for violations have been substantial.

Separate rules relate to e-mail marketing and fax marketing. The fax marketing rules are still under development, with regulators struggling to evaluate whether to allow fax marketing to preexisting customers. On the e-mail front, in recognition (so far) of the fact that a "do-not-email" list will likely be unsuccessful, the rules essentially permit "one free e-mail" but require companies to provide each consumer the ability to opt out of future marketing emails. Companies must make sure they have a means of receiving and policing the opt-outs.

Aside from these core provisions, various other marketing-related principles exist. The Children's Online Privacy Protection Act (COPPA) rules apply if companies collect information online from children for use in connection with marketing or for any other purpose. This rule requires specific permission from parents (and documentation of that permission) before children's information can be collected. This is a high-risk area; be very cautious if your company has any dealings with the online collection of information about children. This applies to colleges and universities as well.

Also, be aware that the Federal Trade Commission enforces privacy commitments made on company web sites. This enforcement has the potential to affect a large number of businesses because more companies operate websites and use them to conduct business than conduct regulated marketing activities. If you make commitments on your website or in your policy about how you will use personal information, whether in the marketing context or otherwise, you need to make sure that you follow through on those commitments.

On the whole, the privacy side of this assessment needs to (1) identify the kinds of information collected; (2) assess what happens to this information once it has been collected; and (3) evaluate the channels and purposes for disclosure of this information, to business partners, vendors, and others.

Social Security Numbers

While broader questions of privacy and security can be complicated, schools and companies should pay special attention to the single most sensitive piece of personal information that exists—the Social Security number (SSN). The SSN is the Holy Grail to a data thief; it is the entryway to a wide range of opportunities for identity theft, financial fraud, and other privacy and security harms. Yet in most cases companies cannot identify to any reasonable degree where they collect SSNs, what the numbers are used for, where they are stored, and to whom the numbers are disclosed. In many cases SSNs are routinely collected and disclosed simply because people are not thinking about the risks.

There is no more effective means of reducing overall privacy and security risk

within a company than to reduce dramatically the use and disclosure of and access to Social Security numbers. When a company collects this information from customers, or a school collects it from students, the risks are substantial. But many companies fail to assess the risks from the collection of SSNs from employees. In many circumstances, SSNs are widely available across companies and distributed to a wide range of service providers and business partners, without reasonable analysis of the need for this information to be provided or extra precautions that could be taken to reduce risks. Every school and company should place an enormous priority on a thorough review of overall practices involving Social Security numbers.

Vendor Management

In addition to your own practices, all schools and companies need to include in their assessment an identification of vendors who receive personal information, including what they receive, why they receive it, and what controls are placed on them. Vendor risks are creating significant legal and practical-management challenges, particularly for entities that employ large numbers of vendors. For most companies, this problem cuts in two directions: Most companies are both "principals" and "agents" and therefore need to develop appropriate contractual protections for both receiving and passing on sensitive data.

Implementing appropriate vendor controls is a legal requirement in most situations. Accordingly, schools and companies must focus their attention on (1) identifying their vendors that receive personal information; (2) ascertaining whether those vendors need to have the data; (3) developing appropriate contractual protections for any vendor that receives or creates personal information; and (4) identifying an appropriate means of monitoring the activities of vendors, particularly those who have either large volumes of data or engage in sensitive activities.

While you are evaluating your vendors, keep in mind that your company is also likely to be a vendor to others, so be prepared to meet the demand for increased contractual commitments from your customers as well.

Security Breach Notice Issues

Much of the credit for making security breaches so visible in recent years rests with the laws in more than 38 states requiring notice of certain kinds of security breaches. These laws apply to any company that possesses the information covered by these laws—primarily Social Security numbers, credit card numbers, and bank account numbers (although California recently added healthcare information to this list). Therefore, every business needs to be aware of these laws. Moreover, because the laws are triggered when something bad—a security breach—has happened, companies need to have a plan, in advance, for dealing with security breaches. It is critical to develop a mitigation plan that addresses not only security breach notice issues but also the wide range of other problems that can arise. *Mitigation* means identifying and fixing a problem so that the harm is minimized or eliminated and the cause of the problem is solved and does not recur.

While notice issues have occupied significant attention, many businesses have failed to assess the underlying cause of security breach problems, leaving themselves open to future problems and more substantial regulatory or legal repercussions. So it is critical for any institution to have in place—before a breach—a plan for addressing and responding to a security breach. Knowing how to handle a security breach needs to be part of an initial assessment, mainly because any business entity—regardless of industry—is likely to have a security breach at some point regardless of the protections in place.

International Issues

As if the complexity of United States privacy and security law were not enough, most companies and institutions also need to consider the impact of international privacy laws. For the most part, each country has developed its own privacy regime, and most are more burdensome and restrictive than those of the United States.

For many U.S. schools or companies, the first brush with the international data regulatory regime is related to student or employee data; transmitting personal data across international borders, particularly leaving Europe, is exceedingly complicated. For others, the requirements arise in relation to outsourcing contracts and other contractual obligations, where institutions or companies are required to make representations about their international compliance or the participation in the Department of Commerce Safe Harbor program. If you receive data from any other country about individuals—whether employees, customers, or others—or send data to vendors or business partners in other countries, you will need to evaluate potential compliance options. Accordingly, as part of your overall privacy assessment, you need to ask the following key questions:

- Do you have personal data that crosses international borders?
- If so, what kinds of data are involved, and why are the data being transferred?
- Do you outsource any functions that involve vendors located in other countries?

Once you have identified these basic data flow issues through the assessment, you can evaluate how to manage them, including identifying what country's laws are involved and how to comply with them. Looking to the future, there is no indication that the international-information dilemma will simplify, particularly as more countries create additional privacy and security regulations.

Conclusion

A privacy and security assessment is just the first step, although a critical one, for an institution or a company to begin to understand the magnitude of the privacy and security risks it faces. The basic message is clear: Privacy and security risks affect every business today. To understand the magnitude of this risk and how best to mitigate it, an institution must have an overall understanding of its data practices and become knowledgeable about whether it is in compliance with the ever-growing array of legal, practical, and contractual commitments imposed by the increasing variety of privacy and security rules.

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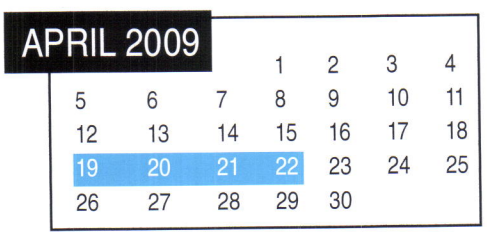

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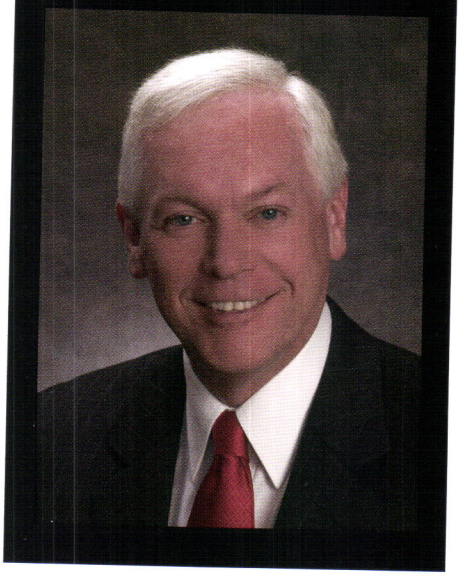

Brian C. Mitchell, Ph.D.

President, Bucknell University

Brian C. Mitchell was named Bucknell University's 16th president in July 2004.

Before joining Bucknell, Mitchell served as president of Washington & Jefferson College (1998-2004) and as president of the Association of Independent Colleges and Universities of Pennsylvania (1995-1998).

His extensive knowledge of private higher education issues is underscored by a demonstrated leadership in working within and outside the university community. A champion of a liberal arts education, Mitchell has committed his career to ensuring an outstanding education at schools like Bucknell.

In spring 2005, Mitchell launched a broadly participative strategic planning process designed to enhance Bucknell's already strong reputation. The process has engaged the Board of Trustees, faculty, staff, students, parents, and alumni in discussions about Bucknell's future. The Plan for Bucknell, a strategic plan that is aspirational, challenging, motivating, and attainable, relies on the support of Library and Information Technology for the management and implementation of its many tactics.

Mitchell received his Ph.D. from the University of Rochester. A specialist in 19th-century urban, ethnic, and labor history, Mitchell is author of *The Paddy Camps: The Irish of Lowell, 1821-1861* (University of Illinois Press, 1988), a critically acclaimed work released in paperback in 2006.

ACUTA: Bucknell's name came up on a short list of campuses that are considered "converged." Would you say you are "fully converged," or is this a work in progress? When did it begin? What was the primary impetus for Bucknell to pursue a converged network infrastructure: enhanced services and applications, the opportunity to combine facilities and support staff, or something else?

Mitchell: Bucknell University converged the Bertrand Library and what was then referred to as Computer and Communication Services nearly 11 years ago, following the formation of a task force that was asked to investigate the benefits of doing so. There was a realization then among the library and information technology staffs and among faculty, the administration, and others that both IT and library services had a common mission of sharing information and that their partnership could enhance their ability to deliver on that mission and at the same time serve core academic needs more effectively than as stand-alone units.

The university saw immediately that convergence would create natural symmetries that would enhance and improve services, reduce redundancies and add efficiencies, and provide opportunities to form cross-functional teams that would benefit from the expertise of each other.

The convergence has come a long way since it started, but is still a work in progress, and we are continually looking for ways to improve and enhance the partnering. Most recently, the university hired a chief information officer, Param Bedi, who oversees the newly renamed division of Library and Information Technology.

ACUTA: How have you approached developing an integrated campus infrastructure? Was there an exploratory or steering committee? If so, what job titles were a part of that committee? If not, what departments took the lead in the process: Academics? Computer services? President's office? Interdisciplinary committee?

Mitchell: Two former associate vice presidents who oversaw the library and information technology branches, Ray Metz and Gene Spencer, led a collaborative effort involving advisory committees and the administration to create the new organization and infrastructure, which continues to evolve.

In fact, we are constantly looking at ways to enhance our service offerings. As mentioned above, the University in January hired a chief information officer. In April, the unit changed its name from Information Services and Resources to Library and Information Technology to reflect the mission of providing library and technology leadership to the Bucknell community. In conjunction with that change, we are continuing to restructure the division to align better with the evolving needs of students, faculty and staff and to be more nimble in fully meeting those needs, including the many mutual needs shared by both the academic and administrative areas. This constant evolution around the knowledge resources at the core of the library and IT dimensions of the University would not be possible if the two groups remained separate entities.

The CIO is leading this effort and working with faculty and administrators to bring about more changes.

Bucknell University, one of the nation's premier undergraduate institutions, combines the personal academic experience of an intimate liberal arts college with the wide choices available at larger institutions, including extensive research and global service-learning opportunities.

Bucknell's Arts and Sciences and Engineering colleges offer more than 50 majors and 60 minors.

Bucknell students – 3,400 undergraduates and 150 graduate students from every state and more than 50 countries – gain exceptional first-hand learning by collaborating with our outstanding faculty in the classroom and on scholarly and artistic projects.

More than 200 student organizations complement the comprehensive academic program, including a Division I Patriot League athletics program nationally known for its stellar graduation rate and Academic All-American record.

Together, these opportunities enable students to learn to think critically and to develop leadership skills in preparation for successful careers and fulfilling lives.

ACUTA: What technical, financial, or organizational challenges have made convergence more difficult? What have been the greatest benefits of the converged approach?

Mitchell: Before we converged, the library catalog and other library systems were maintained by library staff. Since we moved these services to be part of the infrastructure services, the servers are maintained by the staff with the appropriate expertise, and now the library catalog is treated as a critical service for the campus.

It took several years to merge our budgets. In the past, faculty and others were concerned that information technology would take budget away from the library materials lines, but we protect those lines and actually grow them at a larger percentage than IT lines.

Culturally, it took a long time for the two subcultures of IT and library to become converged. For example, the library had a history of excellent service, which the IT side has benefited and learned from over the years. On the other hand, the IT side had a history of strong collaboration and inclusion. Ultimately these strengths influenced both sides.

Among the benefits, convergence led to great improvements in service. The lines between information and technology are blurred for faculty and students since they use technology to access knowledge resources, including research materials. As a merged organization, Library and Information Technology focuses on how its constituencies gain access to these knowledge resources, whether in print or digital form. It aligns services in a way that makes the most sense for them. And because Library and Information Technology is one team, anyone in the organization can easily involve those who have expertise in different areas of these projects without having to worry about reporting structures or turf issues.

The structure enables synergies among staff that might not otherwise take place. It brings appropriate staff together, with the groupings driven by campus needs rather than being forced or arbitrary. It is supplemented by an organizational culture that encourages collaboration.

The Digital Initiatives Group, which consists of a librarian, a programmer, and a manager, is a good example of this. The workgroup is charged with building collections of digital objects, such as images, video, and documents, that support teaching and showcase the university's unique materials. This work crosses traditional library-IT boundaries and requires close collaboration with systems administrators, database administrators, network administrators, instructional technologists, archivists, librarians, and other library staff members. One recent project involved building a collection of materials related to an event hosted on campus. To support this project, the university's network administrator created a tool to easily incorporate streamed digital video into a digital repository system.

Another benefit of convergence is that we are able to move services and people around fairly easily across library and computing boundaries. For example, we moved the equipment that can be borrowed, such as cameras, from the tech desk to circulation. And at the reference desk, which is staffed by librarians at most universities, we have several IT staff members who choose to work shifts there in order in order to grow their skill sets and have more opportunities to interact with faculty and students.

ACUTA: What funding models is Bucknell using to support its campus infrastructure? How would you advise leaders at other institutions regarding the development of a business case to support an integrated campus infrastructure?

Mitchell: Bucknell continues to be well-served by institutional strategic planning efforts. The university has established a Technology Reserve fund and applies a percentage of that reserve each year to fund initiatives brought before and supported by the Library and Information Technology organization and campus advisory committees. Other infrastructure that is supported through this model includes central server infrastructure, network infrastructure, the four-year desktop replacement plan for all faculty and staff, lab and classroom computer replacement, and administrative computing projects.

ACUTA: What role does the campus infrastructure play in supporting research and learning activities at Bucknell? There is some concern at colleges and universities about the power of the network interfering with learning in the classroom. Do you see this as a concern, and if so, what is Bucknell's approach to this potential conflict of interest?

Mitchell: The campus infrastructure supports and enables the research and learning activities at Bucknell. Library and Information Technology works with faculty on various research and curricular initiatives, such as the High Performance Computing initiative, and on applying technology to support teaching in a traditional classroom. About 500 courses each semester, for example, use the learning management system, and Library and Information Technology is always looking at ways to enhance the faculty-student and student-student interaction both in and out of the classroom.

Bucknell is also working on a new curriculum in the College of Arts and Sciences, and one of the elements is information literacy and technology competency. This process will facilitate the librarians and instructional technologists working as a team with faculty on supporting the new curriculum. Certainly, convergence benefits and enhances such collaborations.

In other examples, Library and Information Technology works to support users' affinity for self-paced, independent methods of learning; streamline technology and campus and library services for today's learners; and provide new technologies and delivery methods to enable faculty to teach the way they want to teach. Instructional technologists partner with the Teaching and Learning Center, for example, during new faculty orientation to introduce faculty to new technologies. The use of clickers, or personal response systems, by the physics department and access to Google Maps by geography faculty are examples of how faculty are using technology to push the boundaries of student learning.

ACUTA: What kinds of technology do most prospective students inquire about when they visit Bucknell? Do the senior administrators responsible for technology participate in the strategic planning process for the campus?

Mitchell: Today's students have high expectations for technology and instant access to information. They expect to have wireless, integrated online services and the ability to communicate through and between e-mail, instant messaging and many other formats. It's important that we meet and exceed those expectations to recruit and retain the best students and faculty.

This and other technology needs are incorporated into the strategic planning process that involves faculty committees and administrators at all levels at Bucknell. In addition, technology enables many of the initiatives in The Plan for Bucknell, the university's strategic plan. It is essential that technology be a part of that process.

ACUTA: There may be some aspect of the technology scene at Bucknell that we have not mentioned. Is there some project of which you are especially proud? We invite you to describe any noteworthy endeavors that would provide insight into the current state-of-the-technology on your campus.

Mitchell: We're particularly proud of the information commons design of the main level of the library. When we designed the renovations to the main level of the library in 1999, we purposely placed the four main service points—Reference Desk, Technology Desk, Circulation Desk, and Equipment Desk—within eyesight of each other. Because of this physical configuration, our users are assured that for any question or problem they might have, the staff can easily direct them to the right service point.

In addition to making it easy for staff to physically direct a borrower to another desk, this configuration enables all staff to stay informed about what services are being offered by whom so that they can make sure a question or problem is addressed, by themselves or a colleague, often on the spot. If the staff person who can help is not based at one of the main service points, we routinely walk with the borrower to the work area where the question can be answered. This personalized service model is noticed and sincerely appreciated in particular by new faculty, who often comment that they feel extremely well taken care of when they come to the library for a variety of needs. This is the figurative front door of our convergence effort.

ACUTA expresses appreciation to Dr. Mitchell for taking the time to answer our questions. We hope his comments are helpful as you plan services for your own campus.

The Human Side of Convergence: Voice and Data Teams Working Together

Mary Powell
A1 Teletronics

A converged network poses many challenges. The technical issues in getting voice, data, and maybe even video all on one network are substantial. The task of getting your voice and data techs, engineers, and analysts to work as a team is often even more daunting.

We all acknowledge that the voice and data teams have different cultures that sometimes clash. How does an organization meld these groups into one cohesive team? Experts are aware of this challenge, but many organizations fail to acknowledge the importance of it. The website SearchUnifiedCommunications.com states that merging voice and data teams is "among the most formidable aspects of a VoIP or network convergence implementation." Recognizing the scale and complexity of this task, Robin Gareiss of Namertes Research says, "Companies should allot six to 12 months to address staffing issues and to cultivate a team environment."

Individual Challenges

Among the individual challenges that staffers face is that voice technicians and managers are now becoming network technicians and managers. The same thing is happening in the opposite direction. Most often neither group is prepared for the change, but it happens nonetheless. Cross training occurs in some organizations, but more often than not, people are thrown together and expected to just absorb the new technology.

In addition, the lines of responsibility are blurring. Exactly who is in charge of a voice application that is running on the enterprise network? Sometimes both the voice and data teams want the responsibility; sometimes neither group wants it. With all this going on, the need for teamwork is increasing. We all depend on one another in this type of environment, and somehow we have to make it all work.

On top of all that, technology managers are required to be business managers as well. They need to think and plan long term. They need to know the business goals of the organization or institution. And they need to learn how to communicate with senior management. These are all critical skills when trying to convince the CIO or IT director that some new technology is worth the investment.

With all these changes, it is no wonder people feel insecure. Everyone wants to know where they belong in the new scheme of things. Will they still have a job if the university adopts a VoIP network in place of the legacy system they are used to? What do they need to learn? How quickly do they need to hone their skills? Can they really be expected to work with the people at the other end of the office? Technical people, especially, want to know where they fit in the organization. They like to understand things, and this includes understanding why they are doing what they are doing. Confusion leads to frustration. To keep that in check, it is critical that people understand the new structure and their place in it.

Organizational Challenges

Not only do individuals face challenges, but organizations face them as well. The need for effective communications is at an all-time high when an organization is implementing changes such as creat-

ing a converged network. As a group, the organization must make a concerted effort to communicate plans with everyone involved. This will likely require change. Meetings will involve more people. E-mail notices will need to include everyone concerned. Ideas must be shared among people who previously might have had little in common.

Voice and data teams have developed different cultures. This is partly a result of the nature of the people involved. The nature of the work also has a big influence. The hand-holding that customers required of voice technicians and analysts was simply not required in the data group, so it never developed. The sense of urgency that exists in the telephony department is not nearly so strong among the network gurus. The data group is traditionally technology driven, while the telecom group is service driven. This is not to say one group is better than the other; they are just different. All organizations need to recognize these and many other differences. When blending two groups, recognizing the differences is the first step in creating a cohesive group.

Clearly. we need the skills of both teams. Tony Rybczynski, director of strategic enterprises at Nortel, said, "The IT organization needs to take full advantage of the networking skills in the traditional data group and the end-user understanding in the traditional telephony group."

In addition to understanding two different cultures and working to create a new one blending both, management teams need strong leaders. It must be clear to everyone involved who the leader is. This includes all in-house people as well as telco staff and other vendors. There should be no confusion about who places orders, makes changes, and so on.

Leaders need to make sure goals are consistent and well understood. All members of the group must know where they fit in and understand their roles and responsibilities as well as those of the other members. Coordination of efforts in a converged network is critical.

New network management tools will be required in a converged network. Someone will need to be trained to use them. Unlike in the pure data world, a converged network management tool will go beyond device availability to fine-tuned voice applications. A view of network traffic through the network is no longer sufficient. Service availability from phone to phone is what matters. This is a change from what the network managers grew familiar with.

What This Means to You

In addition to all the new things you need to learn, the new people you have to work with, and the new way you may have to work, other changes are in the air. People are getting laid off. Some are having their jobs outsourced. Others are moving into new departments. Those unwilling to make so many changes are moving into entirely new careers. If you want to continue in a converged environment, you will need to make a few changes yourself and adjust to the changes in your organizational structure.

There are things all of us, voice and data people, will need to understand, including:

understanding some new acronyms including IP (Internet protocol), ICMP (Internet control message protocol), UDP (user datagram protocol), TCP (transmission control protocol) and SIP (session initiation protocol). You may not need to know all the details of how these work, but you will need a basic understanding of what they are and why they are used.

We all need to know how digital voice communications work. This includes understanding latency, jitter, packet loss, and echo cancellation. These concerns are all new to the voice world. You will need to obtain a decent understanding of QoS (quality of service). That means you must know when it is needed, where it might be implemented, and to some extent how it works.

Adding to those issues, the openness of converged environments exposes voice and other applications to threats from the Internet. These were never a concern for voice analysts. They will be now. Familiarize yourself with viruses, worms, DOS (denial of service) attacks, sniffing, and even access to the applications. We all need to know where the threats might come from and how to protect ourselves from them. This is especially true in the university environment, where curious and tech-savvy students can get themselves (and you) in trouble quickly.

What You Can Do about All This

The most important thing you can do is to invest in yourself. According to Dice.com, "Eighty-two percent of IT pros say keeping their skills up-to-date is their biggest workplace concern." If your organization cannot or will not provide training, get it yourself. It is time every employee started thinking of himself or herself as an independent consultant. If you feel you need to learn something to remain competitive, learn it.

The easiest thing to do is read. Read everything: ads, white papers, websites, books, and blogs. Participate in cross-training on your own campus. Put the skills and expertise of your own staff to use in training each other. There is almost no end to the resources available.

Get official training, go to users group or association meetings, attend conferences. Ask questions. If you feel it would be a great benefit to attend a conference that is offering training, and the university doesn't have the budget for it, go yourself. More and more people are attending conferences on their own dime. They share rooms with friends if necessary, use frequent-flyer miles, and find other creative ways to save on expenses. The training they get will benefit their employers, but it also is a huge benefit personally. Be willing to invest in your future.

For convergence training, try resources such as Global Knowledge, Learning Tree, Chesapeake Netcraftsman, and BCR (Business Communications Review). Also check local VoTec schools, community colleges, and product-specific training offered by the manufacturer.

For reading material, subscribe to *Network World, Information Week, Telecommunications, Network Computing, Business Week,* and even the *Wall Street Journal.* Remember that you need to update not just your technology skills but your business acumen as well.

One of the best resources around is *Harry Newton's Telecom Dictionary*, by Harry Newton. It is updated every spring and has been growing every year. The latest edition is about 2 inches thick. It contains plain-English descriptions of all sorts of technology devices, protocols, and techniques. It also contains a definition of just about any acronym you might hear.

Another book you will want to check out is Ray Horak's *Webster's New World Telecom Dictionary.* It contains everything from descriptions of all the 802.11 protocols to describing analog-to-digital converters as well as unified messaging and icky-pic (insulated cable). It is an excellent book and well worth the investment.

On the Web, the resources are endless. If you devote one lunch hour a week to learning what you can on the Web, it will be a good investment. If you simply Google the words *converged network* or *Internet protocol,* you will find thousands of hits. For a more focused view of what's out there, try www.searchunifiedcommuncations.com, www.bitpipe.com, www.linktionary.com, www.nwfusion.com, www.comweb.com, www.netperformance.com, or www.techtarget.com.

A few more that are full of good information are www.pbxinfo.com, www.tek-tips.com, www.webopedia.com and www.skylinecomputer.com. Don't forget to check manufacturer's websites as well. Nortel, Cisco, Avaya, NEC, Mitel, and ShoreTel all have some great resources on their web sites. And look at user group and association websites. Many will tell you that www.acuta.org is a wealth of information.

Last but not least, ask questions. Talk to the telecom and/or network managers at your institution. We are all on a learning curve, and the more we communicate with each other, the better it will all work.

Although voice and data experts have come from different backgrounds, they can, and often do, learn to work together very effectively. With a little forethought and some concerted effort, you can create not only a network that hums but also a cohesive, efficient team to keep it that way.

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Convergence: A Work in Progress

Voice and Data Convergence Is Taking Place at the Network Level, but More Work Is Needed at the Application Level

Paul Korzeniowski

Moving from an old technology to a new one can be a difficult process, but often it turns out to be a worthwhile decision. That is the case with the ongoing migration from traditional public switched telephone network (PSTN) voice systems to the latest IP telephony solutions. The potential benefits of making the switch include reduced costs, streamlined communications, and support of more-powerful, integrated, converged applications. But the process of moving to these new systems can be arduous. Academic institutions need to make significant investments in new voice switches, revamp autonomous network infrastructures, meld voice and data support teams that often have different perspectives, and then deploy new converged applications.

Despite the challenges, a growing number of academic enterprises are moving down that path. Fewer and fewer universities are investing in PBXs, the traditional method of carrying voice traffic, opting instead for IP PBXs. That change has resulted in the worldwide market for enterprise telephony systems reaching the $9.6 billion mark in 2007, a 6 percent increase over its 2006 sales, according to the market research firm Infonetics. The influx of VoIP switches has also affected the makeup of the leading enterprise voice equipment suppliers.Traditional voice hardware vendors, such as Avaya, Nortel, Siemens, and Alcatel-Lucent, continue to have a strong presence in the marketplace. In addition, network equipment suppliers, such as Cisco and 3Com, have become prime suppliers of VoIP switches.

As a result, universities now have many choices as they move from the old to the new. Vendors have developed devices that meet a wide range of needs, from small department-level voice systems to switches that support tens of thousands of users. To date, most customers have concentrated on using these devices to consolidate their campus networks, a change felt mainly in the IT department. Recently, a small, but growing, number of academic institutions have begun deploying converged applications, which streamline the way that staff, faculty, and students communicate. So while the age of converged voice and data communications is now upon us, time will pass before its impact is felt by the entire academic community.

Voice Systems Come with High Price Tags

Because of the complexity of the underlying equipment and the ubiquity of these services, voice switches represent a significant investment (usually millions of dollars) for most academic institutions. To maximize these investments, universities often hang onto these systems for as long as they can, usually at least seven years and sometimes a decade or more. Consequently, these devices are only replaced when they can no longer support a university's telecommunications requirements.

"We had wired the campus three times for voice—about 40 years ago, once 25 years ago, and approximately 16 years ago—so we had a lot of duplicate wiring, and unfortunately little of it was documented," notes Ahmed El-Haggan, vice president of IT and CIO at Coppin State University, which has 4,000 students and 600 staff and faculty members. "As a result, it was difficult for us to make any adds or changes to the voice system." Rather

than complete another rewiring job and upgrade its existing system one more time, the university replaced its ancient Siemens PBX with a Nortel VoIP switch in 2002.

In early 2004, California State University, San Bernardino (CSUSB), which has 15,000 students, 1,000 faculty members, and a 1,000-person staff, found itself with a NEC PBX that was at the end of its life cycle and incapable of supporting the university's burgeoning voice communications needs. "The system was running out of available phone numbers," explained Owen Owens, director of telecommunications and network services at the university, which installed a Cisco VoIP switch in the summer of 2006.

More Modern = Less Expensive

In addition to being a more viable option for meeting universities' long-term voice needs, VoIP switches also are often less expensive than PBX options. Typically, the new IP PBX solutions have a more modern design and therefore lower price tags than PSTN voice systems. CSUSB found that buying two new VoIP switches to cover the whole campus cost as much as adding one more PBX to support half of it.

Coppin State University determined that moving to VoIP would cut its network communications charges by $900,000 per year. The savings came from consolidating autonomous networks. If a campus runs one set of voice telecommunications lines and a separate data network, VoIP enables it to consolidate the two onto a larger pipe and reduce its costs.

Savings also stem from reduced maintenance. Virginia Military Institute (VMI), which has about 1,400 students and 500 faculty and staff members, replaced a Nortel PBX with a Cisco VoIP switch in 2005. "Before, we had two individuals who were doing moves, adds, and changes pretty much full time, and now we have one person doing that work about half time," notes Josh Frank, network manager at VMI.

Calling in the Field Technicians

PBXs usually rely on user interfaces that are difficult to understand, and often making a change requires that a technician physically splice and dice different wires. In certain cases, PBX alterations are so complicated that they can only be completed by vendors' field service teams. VoIP switches automate the change process: Technicians typically work with Web browsers, and changes are made via a simple point-and-click.

The new systems are also better able to support new applications. Swarthmore College, which has 1,450 students, 400 faculty members, a 250-person staff, and 40 buildings, ran 10/100 Ethernet to its dorms and classrooms and has a 1Gbps Ethernet backbone connecting all its locations. The university had an Intecom PBX system that needed to be replaced, so in September 2005, the college issued an RFP to many vendors, including Avaya, Cisco, and Nortel. "We selected the Cisco system because of its distributed architecture," notes Mark Dumic, associate director of networking and telecommunications at the college. The academic institution was able to configure two Cisco switches, so they supported disaster recovery functions. The other vendors' systems were all tied to a central switch.

To date, most of the convergence benefits have been evident mainly in the IT department; but gradually they have begun to impact end users. For instance, VoIP applications offer enhanced end-user functionality. "Our phones have new features, such as telling individuals which calls they missed, and those functions have made our users much more productive," said CSCSB's Owens. "When we were putting the new phones in, many of our users fought us, but now they would not give them up."

From PC to Phone in an Instant

Infonetics notes that shipments of softphones—software that transforms a PC into a VoIP phone so users can make calls via the Internet—rose 55 percent to 385,000 in 2007. "The softphone feature has been very beneficial," says Coppin State's El-Haggan. "Whenever I travel abroad, I can use the Internet to dial into our system and hear my messages while avoiding steep international long distance charges."

In addition, the modern voice switches are able to support new converged services, such as Find Me, Follow Me. Bryant University, which has 3,600 students, a 300-person staff, and 180 faculty members, moved to a Cisco VoIP switch in 2004, and one of its major benefits has been a unified communication application. A call will ring various devices and track down a user who may be working with instant messaging, e-mail, or a voice connection.

This function was designed to lower the likelihood of telephone or e-mail tag but can play a more important role in an academic environment. "Our unified communication system is an important component in our emergency response system," explained Art Gloster, vice president of information services at Bryant University. "It provides us with a quick and simple way to notify users if an emergency arises."

Here Are the Warts

While enticing, VoIP does have limitations. Call quality has been a major concern ever since VoIP systems were introduced, and the reason for that lies in IP network design. In PSTN networks, voice connections are given a dedicated line, so there are no interruptions once a conversation starts. In IP networks, information moves from place to place based on which links are available. A call may have an open link at one moment, but then a large file transfer can usurp much of the available bandwidth.

Latency is a related problem. On a traditional voice line, delays seldom occur. With IP, there may be delay as a connection waits for a free connection to open up. With data applications, the impact of such fluctua-

tions is slight because information is put in the right order once it all arrives at the receiving system. With voice connections, that limitation is more problematic because part of the transmission may drop, causing pieces of a conversation to be lost.

Solving the Call-Quality Problem

There are a couple of ways to address this problem. One is finding ways to prioritize voice traffic. Vendors have different options, so it becomes more likely that voice transmissions have sufficient bandwidth. In other cases, the voice traffic can be totally sequestered from other transmissions.

Some suggest that another option is to buy more bandwidth than the institution needs, so there is enough that its voice connections are not disturbed. However, the issues associated with adding bandwidth vary—often dramatically—on a case-by-case basis, including cost considerations and configuring for QoS.

As it was deploying its VoIP switch, Coppin State was running wired Ethernet connections to users' desktops and dorms. "Since we were putting new data connections in, we decided to add support for voice as well," explains El-Haggan. Not every university experiences such fortuitous timing. Adding voice connections to a data network can be expensive. In some cases, the process means a doubling of network connections.

Because network configurations are unique, the reliability of VoIP can vary from campus to campus. "Initially, we had a few issues with echoes on the line, but that problem was fixed by installing echo cancellers," says Swarthmore's Dumic. In general, users have found call quality to be at least as good—and many would say better—than cellular network call quality.

Voice and Data Departments: An Uneasy Coupling

VoIP may also create new management challenges as two departments suddenly share space and responsibilities.

Telecommunications departments and data networking teams often talk different languages. While the two have historically operated separate fiefdoms, a growing number of academic institutions are melding the duo. The challenge is how to reorganize and train the staff to use the strengths of all the technicians involved in support of the converged applications.

In sum, moving from PSTN to VoIP connections is not easy. Academic institutions often need to put a lot of supporting network infrastructure in place and blend groups that had been working autonomously. However, the potential benefits, such as reduced costs and more efficient communications, seem convincing enough, and many academic institutions are now in the process of making that change.

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The Reinvention of USU IT

Stacie Gomm
Utah State University

One *U* in USU should probably stand for *unique*. Utah State University is a statewide, multicampus system whose main campus is in Logan, Utah. The university recently undertook a project that totally reinvented the Information Technology Department, flattening the typical management hierarchy and replacing it with a somewhat risky, highly innovative and entrepreneurial, team-managed model decidedly unique for a technology support group.

The reorganization has allowed USU IT to create partnerships with other supporting units, such as human resources, controller, registrar, instructional technology, and student information. These partnerships facilitate such things as building Web-based systems, continuing support for online classroom functions, and providing access to an expanding range of recipients.

Old Main at Utah State

The new IT organization fully integrates telecommunications and traditional IT functions. The organizational and cultural changes involved introducing data experts into the telecommunications arena and offering telecommunications experts an opportunity to take on data-related tasks as the organization builds a strong, unified team capable of addressing the needs of the converged campus.

The IT ID

Supported by Information Technology, USU is internationally recognized for its exceptional learning opportunities and commitment to research. IT has been a key contributor, implementing the best technologies available for students, faculty, and staff and empowering them to achieve the highest levels of excellence in learning, discovery, and engagement while working in a safe, secure, and reliable technology environment. IT contributes to the expansion of access to education for a diverse community and enhances the quality of life for individuals and communities with advanced resources and capabilities.

In support of the learning infrastructure at USU, IT reaches out to expand and improve the use of appropriate information technology both inside and outside the traditional classroom setting. We are striving to establish a strong presence across the university to ensure that students have access to technology-enhanced, state-of-the-art classrooms, laboratories, and library facilities.

USU IT respects the needs and requirements of students, faculty, and staff by providing timely and quality customer service. IT is committed to providing environments

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of opportunity that value learning and discovery, individual development, leadership, diversity, outreach, and access.

Through the dynamics of the reorganized structure, leadership training, and new strategies, IT provides innovative technology-based tools and infrastructure to meet the assessment needs of each academic department by having representatives of the team assigned to work with the faculty and staff. IT's operating environment includes processes in collaboration, program development, relevance, and productivity. Such focuses provide services that will encourage scholarship and partnerships, facilitate efforts among scholars with interests in common problems, and continually increase both quantity and quality of information technology people, services, and systems.

To serve USU better, IT values employees who maintain open and honest communications; have the integrity to keep commitments; foster cooperation, trust, and teamwork; provide leadership, initiative, and creativity; exhibit entrepreneurial behavior and positive attitudes; and build a record of proven results. We believe that high expectations result in greater success.

Reorganizing IT

When Kay Jeppesen became vice president of IT at USU in the summer of 2006, he made it clear that the IT department was in need of reorganization in order to be more efficient. Two new associate vice presidents were appointed. Eric Hawley was assigned the technology side of IT, and I was given responsibility for the information side..

The decision to change the organizational model was approved by Dr. Albrecht, president of Utah State; but because IT strives to create an environment of trust and respect among peers throughout USU and beyond, decision making is not considered solely an upper-management responsibility. Technicians, staff, and students were also a part of the decision.

After a great deal of brainstorming and meetings, the implementation of the IT reorganization began in August 2006. Using the principles Jim Collins describes in *Good to Great: Why Some Companies Make the Leap...and Others Don't* (New York: Collins, 2001), IT was able to put the right people in the right position, tailoring the department to fit the needs of the university. As a more efficient organization, IT has been able to extend its services to all the departments on campus. For example, prior to the reorganization, USU had more than 70 different e-mail systems that were managed by 35 staff members. We consolidated the systems, and now five staff members manage the entire system.

As we considered the principles of convergence, one of the first steps in addressing our ability to meet the needs of our clients was to develop a strategic plan. Through this process, it quickly became apparent that we needed to be more customer service oriented. It was also clear that a flattened organization would be more effective and efficient. As a result, we eliminated all director, manager, and supervisor positions that are found in the typical organizational structure and replaced them with teams organized by functions. For example, the Service Desk Team serves as the front door to IT. All calls, walk-in traffic, e-mails, and other means of IT inquiries are directed to the members of the Service Desk Team who then either solve the issue or escalate to one of the more technical teams. Technical teams include System Administration, Enterprise Data Operations, Security, Networking, and Physical Infrastructure, and the team names generally describe their functions. Additionally, we have three other customer support teams organized and ready to meet the needs of students, faculty, and staff in the areas of media production, programming and design, and instructional design. And although the organizational structure is flat, three administrators, the vice president, and the two associate vice presidents remain defined and comprise a unified administrative team for the IT organization.

As in any environment that changes its infrastructure and its culture as well, not all employees were supportive of the change. The switch to a flat organization rather than the traditional hierarchy meant changes in roles and salaries. Some were unhappy with the change. It meant more of an action-oriented role for them with a possibility of a lower salary. But some unique benefits came with the new program. Often, when IT professionals assume management positions, they fall behind in technology, which may be detrimental for their career in the future. With the new program, everyone in IT is actively engaged in several projects at once. Because each project requires different technologies, our professionals are exposed to a wide variety of innovations and advancements every day. We were encouraged that the majority on staff had a "can do" attitude and were ready to move forward.

Recognizing that tracking progress is a vital part of success, we quickly addressed the issues of creating a steady workflow and tracking work in progress. The associate vice presidents attended an intense course on Information Technology Infrastructure Library (ITIL) principles, which is a widely used set of concepts and techniques for managing IT. Using the ITIL framework, we created the Enterprise Service Level Coordination Office, designed to provide project management for non-routine work, including enterprise projects. This process has been fine-tuned as we have progressed with reorganization.

The current process includes identification of a project by various sources—users,

IT personnel, and general observation by administration. Work is then assigned to a project coordinator who chooses team members from the available technical resources inside and outside the IT division. This team is then responsible to the customer for performance and their evaluation of how well they performed.

The project description or service-level agreement (SLA) serves as a contract between IT and its clients. It is tracked through various phases, including planning, authorization, production, and evaluation (lessons learned). This process has been captured by a software program called Footprints, which allows the customer, team members, and the administrative team to track performance and many other aspects of project management. With this program, IT can list a specific timeline of events, actions, assignments, and more to be completed by specific dates.

At each milestone, time is taken to evaluate accomplishments and revise any future agenda items that require adjustment. These evaluations are based on surveys and interviews involving students and faculty. The results are then compared to the goals and future milestones, which can be adjusted to ensure that our goals match the needs and preferences of the university—namely, the students and faculty. Rather than guessing what problems may arise, the customer can use this process of asking for input while the project is under way, customizing the approach and ensuring that all needs are met satisfactorily.

Along with the milestone evaluations, the team working on the project has regular meetings as needed to guarantee the communication of our goals and progress. Although no two projects are alike, the main areas of focus in evaluating projects are the budget needs for the project, the benefits it will provide, the time it will take, the maintenance required before and after completion, and, most importantly, the needs of the university.

Identifying the Goals

USU IT has clung to its original values identified in its strategic plan and maintained its integrity by constant monitoring

of information, projects, relationships, and resources. One of our goals is to provide a secure, wireless information network for official university business while providing easy access for the university community, including visitors, as they interact not just with the local campus but globally.

IT's overarching goal through this reorganization is to provide quality information technology experiences that develop the intellectual capacity, leadership ability, and civic awareness of all students. This integrates with USU's vision by supporting the principle that academics come first, by educating to diversity of thought and culture, and by serving the public through learning, discovery, and engagement. The mission of Utah State is to be one of the nation's premier student-centered land grant universities. IT is focused and dynamic with the flexibility that a team-oriented organization provides to help USU realize its vision.

Challenges and Benefits

As the land grant institution for the state of Utah, USU has a center in every county in Utah plus three regional campuses. This presents many challenges as we work to accommodate the statewide institution.

USU IT took control of all of the wireless Internet systems of the university throughout the state and implemented a system that covers a larger area and reduces costs. Collaboration of this magnitude required working with many different departments with different needs, yet the outcome has been very beneficial.

All resources provided from the university and the state of Utah, along with extramural funding initiatives, have helped USU IT make its dramatic change. No longer segmented into departments—which took on the form of "silos"—USU IT's funds and allocations are now spread to all teams for any and all IT projects.

Another struggle USU IT faced was communicating the new goals to the university at large. In the past, knowledge of project specifications was kept within the IT department. As part of the new program, one of the main goals is to create a level playing field for all IT professionals by providing knowledge openly to everyone. To accomplish this, two programs have been put in place. In addition to the Footprints software mentioned earlier, a wiki has been set up so employees within IT can offer suggestions, ideas, and solutions relevant to existing projects. This allows others to use the knowledge from the entire employee base, rather than just from a specific department as it was before.

It has been somewhat difficult to gain our clients' trust even though project information is now readily available to interested parties outside the department, and we are working hard to establish a healthy exchange in all our working relationships. We are confident of our success in this effort because the response to the new programs has been excellent. In the first year of the reorganization, IT has accomplished more at USU—planned, implemented, and completed more projects that impact more students, faculty, and staff—than IT (under the old structure) was able to do in the previous 10 years. USU IT currently has more than 65 projects under way, and 181 have been completed over the 20 months since the reorganization.

USU IT strongly believes in human capital. This focus on people—a driving force in our change to a team approach to management—has resulted in a stronger labor pool of technologists for economic growth in Cache Valley and the state of Utah and stronger partnerships developed on both national and international levels.

Conclusion

We have made it a goal to create an atmosphere that attracts students with the use of state-of-the-art technical resources, ensuring that every student has access to the technology needed to succeed. We support enhanced and expanded interaction among faculty, staff, students, communities, institutions, and governments and are committed to providing innovative opportunities for students to expand their experience and education.

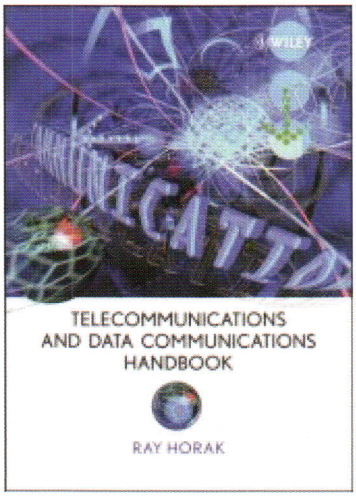
The primary goal of the reorganization was to place the focus on the customers—students, faculty, and staff. In the reinvented USU IT, the needs and preferences of our clients are documented and then incorporated into our goals to direct our efforts and address the actual needs of those being served. With the creation of an active environment of teams and involving multiple areas of IT, it is now possible to brainstorm solutions and successfully provide for the needs of our university with fewer resources.

It has been exciting to see the change. After a period of adjustment, the reactions from students, faculty, staff, and even those within IT have been very positive. Our clients now feel we are working with them on their playing field rather than against them on our own.

Expressing high praise, President Albrecht says, "I am proud of what IT has accomplished and believe this is just the beginning of many advances that will identify Utah State University with high-tech IT support."

Stacie Gomm is associate vice president of information technology at Utah State University. Reach her at stacie.gomm@usu.edu.

(Appreciation for topics in this article is extended to Noah Riley, Lindey Phippen, Cameron Cope, Amy Olson, Brook Buddell, Jared True, Byron Miller, and Ashley Chandler—members of a communications course who used the IT reorganization as the basis of their class project.)



Telecommunications and Data Communications Handbook

Author: Ray Horak, The Context Corporation

Published by John Wiley & Sons, 2007

ISBN 978-0-470-04141-3

Reviewed by Walt Magnussen, Director of Telecommunications, Texas A&M University

Chapters

1 Fundamentals of the Technology: Concepts and Definitions

2 Fundamentals of Transmission Systems: Technologies and Applications

3 Voice Communications Systems: KTS, PBX, Centrex, and ACD

4 Messaging Systems

5 Public Switched Telephone Network

6 Fundamentals of Data Communications

7 Conventional Digital and Data Networks

8 Local Area Networks: Connectivity and Internetworking

9 Broadband Network Infrastructure

10 Broadband Network Services

11 Wireless Networking: Emphasis on Mobility

12 Video and Multimedia Networking

13 The Internet and World Wide Web

14 Network Convergence

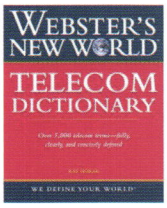
15 Regulation: Issues and (Some) Answers

I recently had the pleasure of reviewing Ray Horak's latest book, *Telecommunications and Data Communications Handbook*. The book's 791 pages, divided into 15 chapters (listed here), cover everything from legacy technology such as basic telephone switching to leading edge technologies such as DWDM optical networks, 3G wireless networks, and IPTV converged video. I have read other Horak books in the past, but this is the most comprehensive one that he has done to date.

The book appears to be best suited as either a text book for a telecommunications class or a reference book. Using Texas terminology, the book is a mile wide but not very deep. You would be hard pressed to find a topic that was not discussed in the almost 800 pages of the book, but most topics are covered in less than one page. It is an encyclopedic work, not the reference that you would use if you needed a comprehensive understanding of any specific technology. On the other hand, if one of your peers brings up a new technology during the course of a conversation (for example MMS), and you want to know what he or she is talking about to avoid appearing uninformed, this book could prove to be invaluable. In other words, it doesn't paint the whole picture in high resolution, but it provides a lot more than a snapshot.

A few of the topics that I found of the most interest included the sections on Broadband over Power Line (BPL), HiperLAN, VDSL, IEEE 802.16 WiMAX and IPTV. There are a few topics that I would like to have seen covered that were not, but this leaves open the opportunity for the next edition.

Overall, I found the book to be a well written wealth of knowledge. I plan to use it as the text for my undergraduate course in telecommunications in the spring.



Editor's Note: A companion book, *Webster's New World Telecom Dictionary*, also written by Horak, is also available. It is a comprehensive telecommunications dictionary of more than 7,500 terms critical to understanding voice, data, video , and multimedia communications system and network technologies, applications, and regulation.

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A. Ensuring adequate replacement-cycle funding is a never-ending issue. Institutions of higher education have always been good at finding one-time money for technology initiatives. Unfortunately, after three to five years, the technology that supported the original initiative requires replacement, and funding for this upgrade is seldom included as part of the original proposal.

I have developed a replacement-cycle model that categorizes all information technology for which we are responsible for maintenance into three major areas, each of which have four to six sub-areas. Updated annually, the model clearly shows what the campus should be spending by sub-area, major category, and total for each of the next ten years. In this way, the president's cabinet has all the data on the cost of the existing technology infrastructure.

However, having the model and sharing it annually with the cabinet still does not ensure all the funding required in any given year. The replacement cycle data drives a major portion of our annual budget request. When full funding is not budgeted, my responsibility is to work with my boss so the campus knows the potential impact of those items not funded. I will say we have been able to secure full replacement-cycle funding for all campus labs, technology enhanced classrooms, network switches for academic buildings, workstations for all tenured track faculty, and about 85 percent of all administrative and staff workstations. The continuing challenge is and has been for network switches for the core and non-academic buildings and communication closets.

Q. Aside from funding, what issue are you, as the CIO, currently spending most of your time addressing?

A. Two initiatives that are consuming a large amount of my time are:

1. Outfitting a second data center on the north side of campus.

2. A 456-day project to provide wireless access to all interior and exterior campus sites.

Q. What is the impact of this issue for your campus? What is your strategy for addressing this issue?

A. The data center is essential, given the need to move as close to 7/24/365 as is reasonably possible—especially in light of the university's creation of a College of Continuing and Professional Studies that is designed to address the need of the nontraditional student in south Jersey. Many of the courses from this college are presented off-campus or online.

The campus wireless initiative is designed to create a campus-wide learning environment at Rowan. When completed, any space on campus will be usable as a learning space.

The second data center initiative resulted from a Provost's Committee recommendation on how to improve the accessibility and reliability of the campus information technologies. Representatives from all colleges, appropriate IR staff, and I served on the committee that presented recommendations ranging from the minimum the campus must provide to an ideal recommendation. The Cabinet accepted and the provost funded the recommendation labeled as "Realistic." The IR team worked to design the second data center in a manner that will provide real-time failover from either data center.

The wireless initiative is being implemented in three phases with each phase addressing specific types of campus space: all academic buildings, all administrative and other non-academic buildings, then all outdoor (open) spaces.

To report on the project's progress, IR has created a wiki page that includes the project time line and where we are as a percent completed of the various phases.

Q. Given that a key function of the CIO's responsibility is preparing the campus to support future technologies, what technology changes do you see for your campus as you look forward five to seven years?

A. I often find myself wishing I had a really good crystal ball; unfortunately, the one I have seems to support a continuous rain cloud. Short of that, I read a significant number of technical journals and business publications to try and foresee what our campus will need to support in the five- to seven-year range.

While I have no firm answers, I am fairly sure that we will have an environment that supports anytime, anywhere access from any type of network-enabled device. Building the infrastructure that is flexible enough to fully support that concept will require a sustained effort on our campus and, I suspect, on many other campuses. The real key is "flexible enough," a term that continues to morph as technologies evolve and new ones are introduced.

Q. How are you readying the campus for these changes?

A. As noted above, I rely on a significant amount of technical and business reading along with attendance at IT conferences (such as ACUTA) that look at the evolving technologies. These activities and venues provide me with the information required to evaluate the potential of various technologies to significantly impact the higher education environment. The technologies that are identified in this process are the ones that I prepare the technology infrastructure at Rowan to support should they actually be adopted by the higher education community.

Reach Tony Mordosky at mordosky@rowan.edu.

FROM THE CIO

ANTHONY MORDOSKY
ROWAN UNIVERSITY
ASSOCIATE PROVOST, INFORMATION RESOURCES / CIO

Q & A from the CIO

Q. Much of the technology we now support in higher education is driven by consumer electronics. What decisions about your technology infrastructure have been impacted by this and how?

A. There was a time when higher education campuses were directly involved in developing information technology/computer innovations. Today development has shifted to the commercial world and higher educational institutions respond to new technology, which often arrives on our campus via students. Developing infrastructures and support mechanisms that are responsive to these developments has presented certain challenges for all of us within higher education.

For instance, at Rowan we use a registration system that checks each electronic device that wishes to connect to the campus network for compatibility and conformance to campus standards. Additional efforts were required to enable the system to permit student gaming consoles to connect to the network as well. While not an academic requirement, about one third of our students live on campus, and this is home for them for about 30 weeks a year.

Q. Freshmen at most institutions today are far more extensive users of technology than those of even five years ago. What is the most challenging technical aspect this presents for your campus?

A. Students arrive on campus expecting to match the technology experience they have at home. Often that experience includes technology that is as current as or even more current than what is available on campus or at least what is available in the discipline-specific lab they encounter. We are on a four-year replacement cycle for most technologies they use, so trying to ensure they have a favorable technology experience on the campus is proving to be very challenging.

An additional aspect of that student experience is the expectation related to Internet connectivity. Given that most of our students come from environments where they have at least a meg of bandwidth available, they have a difficult time understanding why the campus cannot provide the same level of connectivity. If we were to use just our resident population as the basis for connectivity based on 1 Mbps per student we would need in excess of 3 Gbps of Internet bandwidth for the campus. Providing even 20 percent of that would be financially unsustainable.

Q. In what ways has this impacted how you deliver support services?

Freshmen come to the university with an "always available" mind set that includes technical support. Rowan does not staff a help desk 24/7, and therefore has worked to meet that expectation via other means. These alternatives include a website called the IR Toolbox where much information on the campus technology is readily available, including many how-to guides.

In addition, we employ a searchable database of FAQs that can be accessed at any time. If students do not find answers to their questions, they can send an email to the help desk directly from a searchable database web page. While this is not the same as having a staff member available off-hours, we find most students prefer to send an e-mail to the help desk even when the desk is staffed.

Q. Since higher education seems to be perpetually in challenging budget times, what is your most important financial issue? How are you addressing it on your campus?

Continued on page 47

Rowan University is a public university located in Glassboro, New Jersey, comprising 49 buildings. There is also a satellite campus in Camden, New Jersey. The school was founded in 1923 as Glassboro Normal School with the mission to train public school teachers. The school became New Jersey State Teachers College at Glassboro in the 1930s, and later became Glassboro State College in 1958. Starting in the 1970s, it grew into a multi-purpose institution, adding programs in business, communications, and by the 1990s, engineering. It was renamed Rowan College of New Jersey in 1992, after Henry Rowan and his wife Betty gave $100 million to the school. It became Rowan University on March 21, 1997.

Enrollment at Rowan is approximately 9,600. It is divided into a Graduate School and seven academic colleges: Business, Communication, Education, Engineering, Fine & Performing Arts, Liberal Arts & Sciences, and Professional & Continuing Education.

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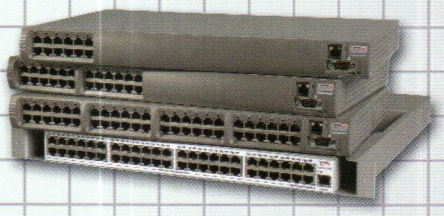

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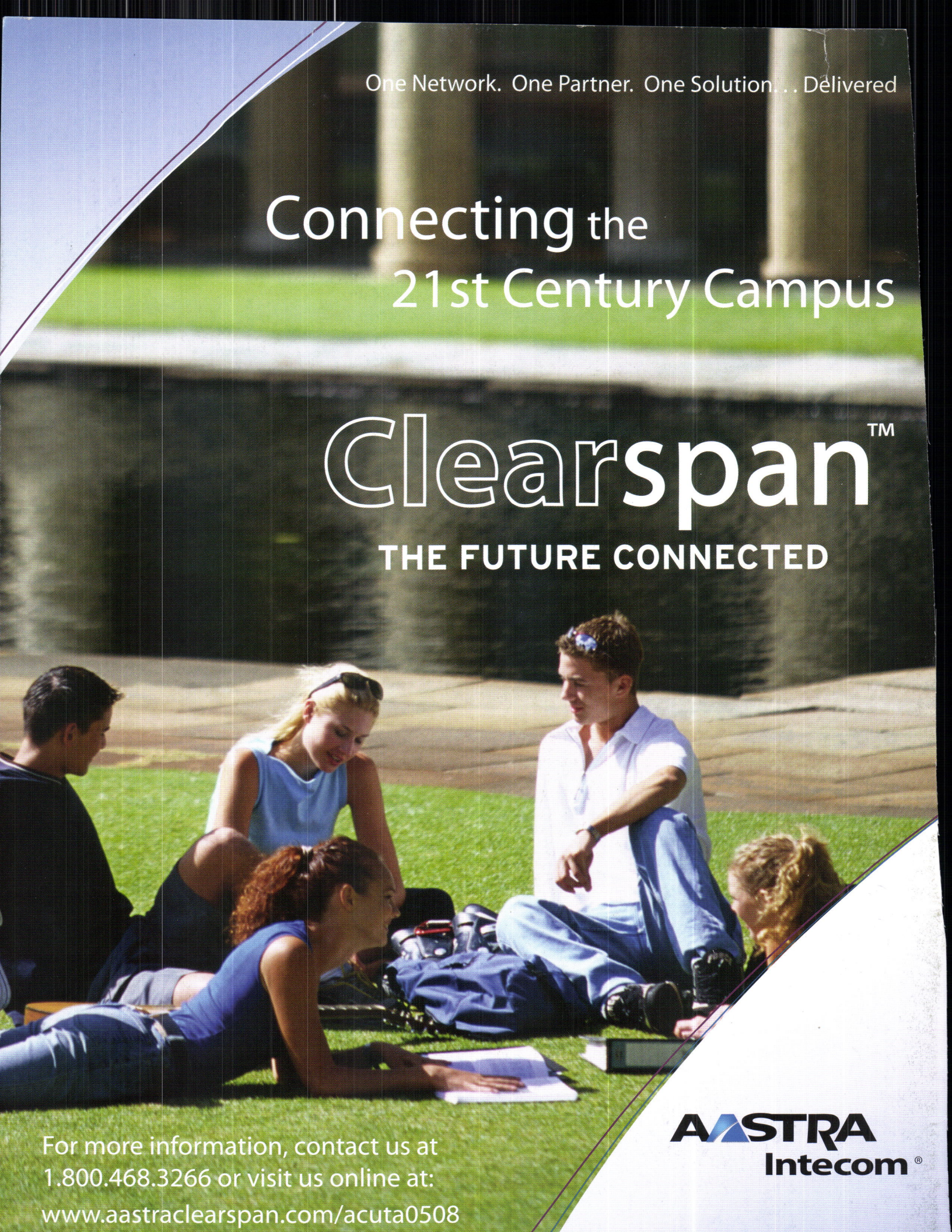
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